HAND-HELD RESPIRATORY MECHANICS MONITOR

Service Manual

Model 101

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Catalog No. 6800-90-01

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  Flat rate parts-exchange
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Section 1 *Safety*

The *VENT✔* Handneld Respiratory Mechanics Monitor, Model 101, is electrically isolated. Patient leakage current flowing from the instrument to ground is limited to less than 10 uA.

- Keep the *VENT✔* and its accessories clean. Do not operate the *VENT✔* when it is wet due to spills or condensation.
- Connect only Novametrix Series 3 Flow Sensors to the *VENT✔*. For maximum performance; keep the pressure sensor ports oriented upward, and keep the sensor clear of moisture and secretions by proper breathing circuit maintenance.
- Connect the sensor first to the *VENT✔* and then to the patient breathing circuit in order to limit circuit volume loss and to avoid excessive moisture build-up in the flow sensor tubing.
- *VENT✔* has electrically isolated inputs. Patient leakage current flowing from the instrument to ground is limited to less than 10 µA at 120 V, 60 Hz. Patient isolation is greater than 10 MΩ, 2500V rms at 60 Hz.
- Where electromagnetic devices (i.e., electrocautery) are used, patient monitoring may be interrupted due to electromagnetic interference. Electromagnetic fields up to 3 V/m will not adversely affect system performance.
- *VENT✔* contains no user serviceable parts. Refer servicing to qualified service personnel.
- This product and its accessories which have patient contact are latex free.

For maximum patient and operator safety, observe the following warnings and cautions.

WARNINGS

Indicates a potentially harmful condition that can lead to personal injury.

- **Explosion Hazard:** Do NOT use the *VENT✔* in the presence of flammable anesthetics. Use of this instrument in such an environment may present an explosion hazard.
- **Electrical Shock Hazard:** Always turn the monitor off before cleaning it. Do NOT use a damaged monitor or sensor. Refer servicing to qualified service personnel.
- **Fire Hazard:** The *VENT✔* should not be exposed to elevated oxygen levels at elevated pressures. Use in such an environment may present a fire hazard.
- **Failure of Operation:** If the monitor fails to respond as described, do not use it until the situation has been corrected by qualified personnel.
- Do not apply tension to the sensor tubing while connected to a patient breathing circuit, as accidental extubation may result.
- Do not position the flow sensor's tubing in any manner that may cause entanglement or strangulation.
- Use the optional external battery charger in non-patient areas only.

CAUTIONS

Indicates a condition that may lead to equipment damage or malfunction.

- Federal (U.S.A.) law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.
- Electrical Shock Hazard: Always turn the monitor off before cleaning. Do NOT use a damaged monitor.
- Do NOT use a damaged flow sensor.
- Do NOT immerse the monitor or sensors in liquids.
- Do NOT sterilize the monitor or the sensors.
- No user serviceable parts inside. Refer servicing to qualified service personnel.
- Operate at temperatures between +10° C to +40° C (50-104° F), < 90% relative humidity (non-condensing).
- Avoid storing the monitor at temperatures less than -20° C or greater than +55° C (<-4° F or >131° F).

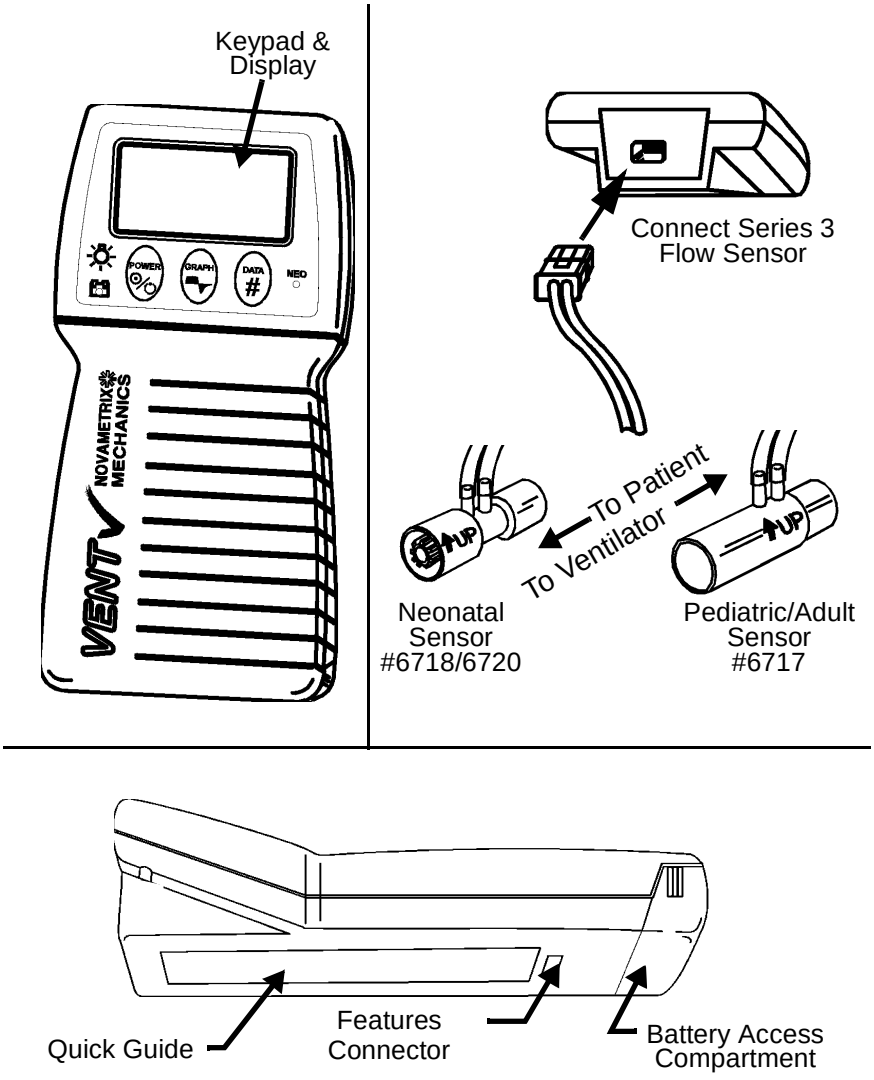
NOTES

Indicates points of particular interest or emphasis for more efficient or convenient operation.

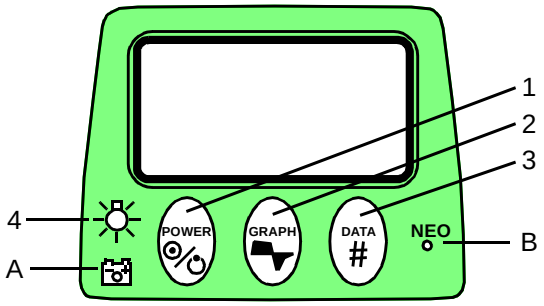
- The *VENT*✔ operates with Novametrix Series 3 Flow Sensors only.
- The *VENT*✔ performs an automatic zero (self calibration) periodically and as needed. During this time, monitoring is interrupted for less than three seconds.
- The automatic zero can be manually initiated by simultaneously pressing the DATA and GRAPH keys. After changing the sensor from Adult to Neonatal (while the *VENT*✔ is operational), wait 30 seconds then perform an automatic zero.
- This product and its accessories which have patient contact are free of latex.
- The C_{20}/C Compliance Ratio (neonatal) parameter is not supported.
- To determine the *VENT*✔ software version, turn the monitor on. During the self test performed at power up, the software level is shown on the third line as “main-101-xx”, where “xx” is the software version.
- Some *VENT*✔ monitors were produced with the statement “Use only Novametrix approved devices, 13 VDC, 1A” located on the label at the Flow Sensor Input Connector. This erroneous statement does NOT apply to the *VENT*✔ monitor and should be ignored.

Section 2 *Introduction*

The *VENT*✔ Handheld Respiratory Mechanics Monitor, Model 101 is shown below.



2.1 Keypad Controls and Indicators



#	Key	Action	Function
1	POWER	Press	Turns *VENT✔* on/off.
2	GRAPH	Press	Display Graph Screens. Additional presses causes *VENT✔* to sequence through available Graph Screens.
3	DATA #	Press	Display Data Screens. Additional presses causes *VENT✔* to sequence through available Data Screens.
4	☼	Press	Turns display backlight on/off.
		Press & Hold	Adjusts contrast/viewing angle of display (1 step/sec.)
A	🔋	None	Illuminated if powered from battery Green; battery charged Yellow flashing slowly; capacity getting low Red flashing quickly; exhausted in 10-15 min.
B	NEO	None	Illuminates when a Neonatal sensor is connected.

2.2 Symbols

Symbol	Description
	Patient Isolation Identifies patient isolation connection as type BF.
	Attention Consult manual for detailed information.

Section 3 *Theory of Operation*

3.1 Main Board

3.1.1 Power Supply

Refer to page 4 of the schematic 2740-03. An external power source can be connected to J403 to power the monitor and charge a rechargeable battery (only Novametrix approved rechargeable batteries and chargers should be used with the model 101). The internal battery connects to the cathode of D11, fuse F1 provides overload protection. Since the monitor has the possibility of being powered by the internal battery or an external charger, diodes D4 and D11 isolate each of these sources from one another.

3.1.2 Reference Voltages

Refer to page 5 of the 2740-03 schematic. A 2.5 volt reference (AVCC_2) is generated by U10 and buffered by U1A. This voltage is amplified by U1B and Q1 and supplies a 5 volt line (AVCC). The 2.5 volt reference is divided down by resistors R6 and R7, buffered by U2B to supply a 1.5 volt reference (A_1_5V). A negative 2.5 volt reference (NEG_AVCC_2) is generated by U9B and Q9 which are set up as a unity gain inverting amplifier fed by the 2.5 volt reference (AVCC_2).

3.1.3 Battery Charger

Refer to page 9 of the 2740-03 schematic. The internal NiMH battery will charge when the monitor is connected to the DC wall mount adapter or installed in the cradle option. Battery charging is controlled by U11, a frequency modulated fast charge controller. U11 monitors temperature, voltage, and time throughout the charging process to safely and effectively charge the internal battery. The charger is configured to terminate charging using the $\Delta T/\Delta t$ (delta temperature/delta time) method of charge termination. Charging is maintained at the C/4 (600mA) rate while current to the battery is controlled by Q11, Q2, Q12, and the MOD output of U11. Q2 provides base drive for Q11 while Q12 serves to shut Q11 off very quickly on a cycle by cycle basis allowing the large currents required for charging to pass through Q11 which is a surface mount SOT-23 package capable of 500mW power dissipation. Temperature is monitored using the battery's internal thermistor, R115, R116, and R118. Resistors R115, R116, and R118 set the $\Delta T/\Delta t$ charge termination parameter to 1ºC per minute. R39 and R106 set the maximum temperature for charge termination (a safety override) to 45ºC. Battery charging is initiated in one of two ways. Either by applying 13 VDC to +VCHG, therefore providing power (BVDD) to U11, or by inserting a rechargeable battery into the battery compartment (provided external power is available). Resistors R34 and R36 set up a divider which determines whether the installed battery is within the correct voltage range for charging. BVDD is regulated by D1, a 5.1V zener diode while R35 keeps D1

operating in the knee region and C68 and C69 provide filtering. Over current protection is provided by F2, a 1A slo-blo replaceable fuse. Reverse leakage protection is provided by D2 and D7 which prevents the battery from trying to power BVDD and +VCHG in the battery operation state.

3.1.4 On/Off Control

Refer to page 4 of the 2740-03 schematic. When the power key is pressed the cathode of D3 is brought to ground, bringing the anode low, this biases Q3B on and allows VDCIN to power the unit. Pressing the power key again will signal the processor that the unit must power down. The processor will assert the POWER_HOLD line (low) to bias Q4 off, this will turn Q3B off and power the unit down.

The voltage level of the battery (or power source) is monitored by U13A. If the VSWDC level drops below a certain threshold then comparator U13A will go low, this will pull the POWER_HOLD line low through D19 and shut the monitor down.

3.1.5 Digital Control and Microprocessor

Refer to page 1 of the 2740-03 schematic. The system is controlled by microprocessor U18. Eight analog channels are monitored and processed and several digital lines are generated for various operations. The analog channels are monitored and converted to digital information by the microprocessor. These channels are listed below:

ANALOG CHANNEL	DESCRIPTION
ACH_0	Airway flow channel X1
ACH_1	Airway flow channel X10
ACH_2	Airway flow channel X100
ACH_3	Airway flow channel X1000
AWPRESS	Airway pressure zero
ABPRESS	Barometric pressure
F5V	CPU power plane measurement
VBATTADC	Battery voltage measurement

The digital lines are listed below:

DIGITAL LINES	DESCRIPTION
8255_CS	Chip select for programmable peripheral interface, U22
DAC_SDI	Serial data input line for U8 and U25
DAC_LD	Load assert line for U8
DAC_CLK	Clock signal for U8
OCDRV_0	Drive signal for opto isolator 1
OCDRV_1	Drive signal for opto isolator 2

OCDRV_2	Drive signal for opto isolator 3
POWER_HOLD	Signal line asserted low for powering down the monitor
VLV_CNTL	Valve control line used for zeroing pressure sensors
CLKOUT	1/2 of the system clock output (6MHz)
MPU_TXD	Serial communication transmit line
MPU_RXD	Serial communication receive line
750KHz	Clock input signal for audio output pulse width modulated signal
EE_OUT	Erasable EPROM data output signal
LED_PWM	Clock output signal for display back light
EE_CS	Erasable EPROM chip select
COMMPWR	Enable/sleep control for RS232 Transceiver, U17
AUD_CLK	Audio drive output signal
ALE	Address line enable (A0-A7)
INST	Control line for RAM and ROM access
WR	Write enable
RD	Read enable

Crystal Y1 sets the operating frequency at 12MHz. System software is stored in U21, a flash ROM device, and system RAM in U19. Decoding for the RAM and ROM is handled by U27, U28 and U20. Address lines A0-A7 are shared with data lines D0-D7, U15 decodes the data lines as address lines when needed through the ALE line.

The digital supply is monitored by U26, if the voltage drops below a certain threshold then the SRST* signal will reset the system. The SRST* line will also bias Q8 off, this will assert the RESET line that will reset other chips on the board at the same time that the microprocessor is reset.

3.1.6 Serial Communication

Refer to page 2 of the 2740-03 schematic. Serial communication is handled by U17, the transmit (MPU_TXD) and receive (MPU_RXD) lines are converted into RS232 levels by U17. Diodes D13 and D14 are for protection on the processor side of U17. Capacitors C62-C65 are used by U17 for generating the required voltages for the RS232 levels. L1 and L2 are high frequency filters for immunity and susceptibility. The RS232 signals appear at the rear connector of the unit and at J401 (circuit board mounted header connector). The COMMPWR line from the microprocessor enables U17 when high, when set low U17 is put in sleep mode to conserve power.

3.1.7 Audio

Refer to page 2 of the 2740-03 schematic. Audible tones are generated by LS1 when driven by Q13. The AUD_CLK line from the microprocessor biases Q13 on and off creating the desired tone output from LS1. A 750KHz clock signal is generated by U31 from the 6MHz system clock. This clock input is

required by the processor for generating the audio tones of AUD_CLK. The RESET line on U31 prevents any audio from inadvertently being generated by disabling the chip during power up and power down. Audio is used for low battery only. There are no other alert outputs in this monitor.

3.1.8 Interface

Refer to page 3 of the 2740-03 schematic. The microprocessor interfaces to the display, key panel, and LED's on the 2741 board through U22. U22 also interfaces to the optical isolators (located on the 2740 board), which determine which type of flow sensor is installed (adult, neonatal, or neonatal/CO2). The microprocessor communicates to U22 via the A0, A1 address lines, D0-D7 data lines, 8255_CS, RD and WR lines. The PA0-PA7 lines are a buffered data bus which go to the 2741 board where they are used as latched I/O. The PB5-PB7 lines decode the appropriate latch on the 2741 board for display and LED indicator output and key-panel input and the PC5-PC7 lines drive the opto isolators on the 2740 board.

3.1.9 Analog Control Signals

Refer to page 5 of the 2740-03 schematic. The serial to DAC (digital to analog converter) U8 contains four independent DACs for control signals in the system. A 1.5 volt reference (A_1_5V) is used as the reference input to all four DACs via U12A, an amplifier with a gain of 2. The clock (DAC_CLK), load (DAC_LD) and data (DAC_SDI) lines are directly controlled by the microprocessor.

DAC_A and DAC_B's outputs are used for gain control in the flow measuring circuitry. DAC_C's output is used for offset adjustments in the airway pressure measuring circuitry. DAC_D controls the VDISP voltage through U9A and Q10, this varies the contrast on the monitor's display.

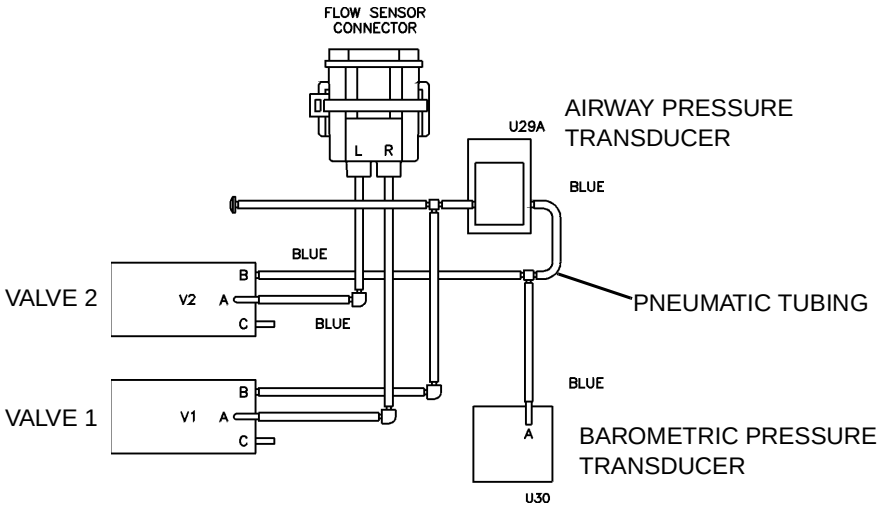
3.1.10 Sensor Identification

Refer to page 8 of the 2740-03 schematic. When a flow sensor is plugged into the monitor it is automatically identified by means of a reflective/non-reflective label that is read by the monitor's circuitry. Three opto isolators are used to emit a light and measure any reflection from the label. There are three bands that can reflect or absorb light, this enables eight distinct possibilities. The opto isolators are driven by OCDRV_0 through OCDRV_2 which drive Q5-Q7 respectively. If an opto isolator receives a reflection then the transistor portion will conduct and trigger a comparator output (U13) to go low. The outputs OCRD-0, OCRD_1 and OCRD_2 will be read by U22 and allow the processor to determine the type of flow sensor connected.

3.1.11 Flow Zeroing

Reference page 3 of the 2740-03 schematic. The zero process begins when the CPU brings the VLV_CNTL line high, this biases Q3A on energizing valves V1 and V2. This disconnects the differential pressure transducer U29 (via V1 and V2) and the absolute pressure transducer U30 (via V2) from the

patient airway, and opens all pressure transducer ports to atmosphere. Diodes D16 and D17 are for protection against back EMF from the valves coils.



The pressure transducers are “zeroed” by adjusting the amplified and conditioned pressure output signals so that each reading reads approximately mid-scale (512 counts) using a successive approximation algorithm. With a reference voltage of 5.0 Volts, each count returned by the 10-bit ADC is equal to 4.883 mV. Centering the no flow (ambient) signal to the ADC's mid-scale allows the sensor to report both positive and negative airway pressures. U8, a Digital to Analog Converter (DAC) provides the adjustment under microprocessor control. The DAC maintains each adjustment voltage obtained during the zeroing process until a new zero cycle is initiated.

The patient airway pressure transducer is "zeroed" first by adjusting the UB_DAC_A output of the DAC until the Airway Pressure signal reads mid-scale. The barometric (ambient) pressure as sensed by the processor is recorded after the airway pressure zero is completed. Next the flow channels are zeroed. A non-inverting summing amplifier U6A combines two of the DAC's outputs and a constant voltage from AVCC equal to the mid-scale of the ADC. The output voltage produced by the summer is fed into U14, a monolithic instrumentation amplifier, which takes the differential output of the pressure transducer, U29, and adds an offset equal to the reference voltage input. DAC outputs UB_DAC_A and UB_DAC_B serve to provide the flow channels with a fine and a course adjustment. The result from each channel is stored in SRAM and used as an offset in the flow calculations. Valves V1 and V2 are then de-energized, reconnecting the pressure transducers with the patient airway.

3.1.12 Flow Circuitry

Reference page 6 of the 2740-03 schematic. Differential Pressure Transducer, U29, is a silicon-based, piezoresistive bridge with four active elements. When pressure is applied between transducer ports P1 and P2, a differential output voltage proportional to the applied pressure is produced. The full-scale input pressure range for the transducer is 0 to 4 inches of water (P1>P2). By setting the 0 differential pressure (no-flow) point to mid-scale (during the zeroing process described earlier), negative pressure readings (P2>P1) are also available. The transducer is temperature compensated at 25 degrees Celsius and designed to be driven by a constant current source (U6B).

In the normal system operating mode, all valves are de-energized. Transducer ports P1 and P2 are connected to the patient airway. As air flows through the flow sensor, a pressure difference between P1 and P2 is created. This signal is dependent on both the magnitude and the direction on the air flow. The greater the flow volume, the larger the pressure difference created between the two transducer ports. The transducer senses an inspired flow as a positive pressure difference (P1>P2), while an expiratory flow is

seen as a negative pressure (P2>P1). With a source voltage of approximately 5.0V, the sensor transforms this pressure difference into an electrical signal with a nominal absolute magnitude of 50 mV Full-scale Output. This signal is conditioned and amplified by U14, which is a monolithic Instrumentation Amplifier (IA). The flow IA U14 also offsets the signal to the mid-range of the ADC obtained during the zeroing process. A positive pressure difference (inspiratory flow) creates a signal above the offset (approximately 1.25 to 2.5V). A negative pressure difference (expiratory flow) becomes a 1.25 to 0V signal. The nominal gain of U14 is set by fixed resistor R59 and variable resistor VR1. The output for the transducer is adjusted using VR1 and a known pressure input as a calibration reference. With an input differential pressure of 10 inH_2O, the gain of the amplifier is set to give an ADC count of 3498.

The signal out of the flow U14 is taken through a two-pole low pass filter U7B with a 31Hz cutoff frequency to remove unwanted high frequency electronic noise before it is passed on to the four gain stages (U4 and U5). The four flow differential gain amplifiers provide signal gains of 1 (ACH_0), 10 (ACH_1), 100 (ACH_2) and 1000 (ACH_3). The gain of 1 amplifier is used to buffer the flow signal and provide signal conditioning consistent with the other channels. The x10, x100 and x1000 channels amplify the flow signal according to the following equation:

$$V_{out} = (V_{flow}\text{-Vrefo}/2)(A_v) + (\text{Vrefo}/2)$$

where A_v is the amplifier gain, R_{fb}/R_v (1, 10, 100 or 1000)

R_{fb} is the feedback resistor (R51,R58, R68, R78)

R_v is the reference resistor (R131,R61, R73, R82)

The circuit is designed to amplify the difference between the flow signal into each gain stage and the reference voltage so the zero point of each stage remains at mid-scale.

The output from each gain stage appears at the microprocessor for conversion into digital information. An alternate pressure transducer, U29A may be installed in place of U29. The principal of operation is the same as described above with the exception that it’s full scale pressure input range is 0 to 10 inches of water and it is excited by a constant 5.0 volt (AVCC) reference.

3.1.13 Barometric and Airway Pressure

Refer to page 7 of the 2740-03 schematic. U30 is a piezoresistive differential pressure transducer with port P2 held at a vacuum (0 psi). It measures the absolute pressure difference at port P1 relative to the vacuum at port P2. The transducer is calibrated for a full scale output of 0 to 30 psi, has internal temperature compensation and is designed to be driven by a constant current source. Resistor R99 is used to set the current through the sensing bridge by amplifier U7A. Instrumentation amplifier (IA) U23 conditions this signal to correspond to the current barometric pressure, which is set by adjusting VR2 for span and VR3 for offset. The nominal gain of this amplifier is 68.75. The output signal from U23 appears as an input to both the 10-bit ADC and a second IA, U24. U24 provides gain adjustment via VR4 and offsets the output signal from the barometric amplifier to mid-scale during the zeroing state. This is handled by the AW_DAC line from U2A (page 5 of the 2740-03 schematic), the output is then fed to the low pass filter circuit of U12B. The nominal gain of the airway pressure amplifier is 2.1. This signal connects to the P1 (proximal to the patient) side of the differential pressure transducer during monitoring and provides patient airway pressure sensing (AWPRESS).

3.2 Interface Board

3.2.1 Key panel Interface

Refer to page 1 on 2741-03 schematic. The key panel keys are monitored by the system through latch U4. When any key is depressed the associated pull-up resistor (R9-R13) is brought low and the appropriate line will appear as a low on the PD0-PD7 line. The latch is read by U22 from the main board (lines PD0-PD7) when the 0xF800 line is asserted.

3.2.2 Display interface

Refer to page 1 on 2741-03 schematic. Communication to the display is handled by latches U1 and U2, these in turn are controlled by U22 on the main board. U1 is enabled by the oxF806 line and handles the display data lines DS0-DS7. The remaining control lines are handled through U2 and the 0xF807 line.

3.2.3 LED control

Refer to page 1 on 2741-03 schematic. The LEDs on the front panel display are controlled by latch U2 and the 0xF807 line. LEDs D1 and D2 are bicolor LEDs that are controlled by two lines each. D3and D4 are unicolor LEDs.

3.2.4 Power Supplies

Refer to page 2 on 2741-03 schematic. The VSWDC supply from the main board is regulated to a +5 volt supply by U3, a VALVE_SUPPLY supply by U7 and ±12 volt supplies by U5 and U6. U7 is used as a separate5 volt regulator for the main board valves. The other supplies are connected to the main board through J2.

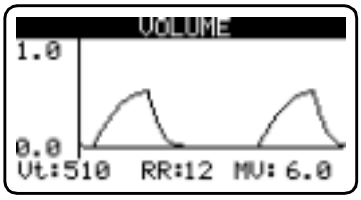
Section 4 — *Functional Tests*

4.1 Equipment Required

1. Adult Flow Sensor Cat. No. 6717-01
2. Neonatal Flow Sensor Cat. No. 6718-01
3. Battery Case Cat. No. 6862-00
4. AA 1.5 VDC Alkaline Batteries (Qty 7) Cat. No. 400038
   (Panasonic AM3X or equivalent)

4.2 Procedure

1. Inspect the unit for cosmetic defects, verify no damage.
2. Install the Battery Case (loaded with seven good AA Alkaline batteries).
3. Press the **POWER** key to power up the unit.
4. Connect the 6717-01 Adult Flow sensor to the unit.
5. Breathe into the flow sensor.
6. Press the **GRAPH** key and verify that all of the Graph screen is functioning properly;



VOLUME GRAPH

- Automatically scaled.
- Breath-by-breath reporting.

7. Remove the flow sensor from the unit. Verify the unit displays “NO SENSOR DETECTED INSERT FLOW SENSOR”
8. Connect the 6718-01 Neonatal Flow Sensor to the unit under test. Verify a “NEW SENSOR DETECTED TYPE: Neonatal” is temporarily displayed. Verify the **NEO** LED illuminates.
9. Remove the flow sensor.
10. Press the ☼ lamp key and verify that the backlite shuts off.
11. Press the ☼ lamp key again and verify the backlite turns back on.

12. Press and hold the ☼ lamp key and verify that the contrast is adjustable. Set the contrast to a desirable level.
13. Power the unit down by pressing the **POWER** key.
14. Press and *hold* the **DATA** key, then press the **POWER** key to power up the unit in the engineering menu.
15. Verify the AC LED is off and the battery LED is on.
16. Press the **GRAPH** (next) key until the arrow is beside “TEST LEDs”.
17. Press the **DATA** (select) key to start the LED test. Verify the LED that corresponds to the displayed LED test is ON.

LED Test	LED On	LED Color
Neo	Neo	Green
LED TEST	Battery	Red
Battery OK	Battery	Green
Low Battery	Battery	Yellow

18. Press the **GRAPH** (next) key until the arrow is next to “EXIT”. Press **DATA** (select) to return to normal operating mode.
19. Power the unit down by pressing the **POWER** key.
20. The Functional Test Procedure is complete.

Section 5 *Accuracy Tests*

5.1 Equipment Required

1. Calibrated Barometer
2. Adult Flow Sensor, PN: 6717-01
3. Neonatal Flow Sensor, PN: 6718-01
4. 500 cc Calibration Syringe, Hans Rudolph 5550 or equivalent
5. 10 cc Calibration Syringe, Hans Rudolph, Model 5520 or equivalent PN: 550032
6. Flow Leak Test Adapter, PN: 6935-48
7. Common Mode Test Adapter, PN: 6937-48
8. Pressure Source, Penwalt Pneumatic Calibrator, Model 65-120 or equivalent
9. Battery Case Cat. No. 6862-00
10. AA 1.5 VDC Alkaline Batteries (Qty 7) Cat. No. 400038
    (Panasonic AM3X or equivalent)

5.2 Procedure

1. Install a Battery Case (Cat No 6862-00) with seven fully charged AA batteries (Cat No 400038) in the Model 101.
2. Press and *hold* the **DATA** key, then press the **POWER** key to power up the unit in the engineering menu.
3. Verify the AC LED is off and the battery LED is on.
4. Press the **GRAPH** key (next) until the arrow is beside “CALIBRATION” then press the **DATA** key (select).
5. Read the current barometric pressure from the calibrated barometer. Verify Pbar equals the current barometric pressure $\pm$ 2.
6. Connect the 6935-48 Flow Leak Test Adapter to the unit.
7. With the stop cock on the FLow Leak Test Adapter open, set the airway pressure (Paw) to 100 - 110 cmH_2O.
8. Close the stop cock.
9. Verify the airway pressure (Paw) remains the same for at least 30 seconds.
10. Disconnect the Flow Leak Test Adapter.

11. Connect the 6937-48 Common Mode Test Adapter to the unit.
12. Using the pressure source, apply 20 cmH_2O to the Common Mode Test Adapter.
13. Verify a Paw value of 20.0 ± 2.0.
14. Increase the pressure source to 80 cmH_2O.
15. Verify a Paw of 80.0 ± 2.0.
16. Press the **POWER** key (EXIT) to exit the Calibration screen. Press the **GRAPH** (next) key until the arrow is beside “EXIT”, then press the **DATA** (select) key to exit.
17. Connect the 6717-01 Adult Flow Sensor to the 500cc Calibration Syringe, then connect to the Model 101.
18. Press the **DATA** key to display the Flow/Volume screen (repeated key depressions may be required).
19. Pump the Calibration Syringe at approximately 20 cycles per minute (one stroke every 3 seconds), use a smooth and steady action when pumping the syringe.
20. Verify VTi and VTe read 500ml ± 25ml.
21. Press the **GRAPH** key. Verify the Volume screen is displayed (repeated key depressions may be required).
22. Verify a Vt of 500ml ± 25ml with a volume waveform present.
23. Remove the Adult Flow Sensor. Verify the unit displays “NO SENSOR DETECTED INSERT FLOW SENSOR”
24. Install the 6718-01 Neonatal Flow Sensor. Verify a “NEW SENSOR DETECTED TYPE: Neonatal” is temporarily displayed. Verify the **NEO** LED illuminates and the Volume waveform screen is then displayed.
25. Connect the Neonatal Flow Sensor to the 10cc Calibration Syringe.
26. Pump the syringe at approximately 40 cycles per minute (one stroke every one and one-half second).
27. Press the **DATA** key to display the Flow/Volume screen (repeated key depressions may be required).
28. Verify a VTi and VTe of 10ml ±2 ml.
29. Remove the flow sensor.
30. Power the unit down by pressing the **POWER** key.
31. The Accuracy Test Procedure is complete.

Section 6 Electrical Tests

6.1 Equipment Required

1. Digital Multimeter, Fluke model 8840A or equivalent
2. Oscilloscope, Tektronix model 2236 or equivalent
3. Pneumatic Calibrator, Pennwalt Model 65-120 or equivalent
4. Calibrated Barometer
5. Flow Leak Test Adapter, PN: 6935-48
6. Differential Test Adapter, PN: 6936-48
7. Common Mode Test Adapter, PN: 6937-48
8. Adult Flow Sensor, PN: 6717-01
9. Neonatal Flow Sensor, PN: 6718-01
10. 500cc Calibration Syringe, Hans Rudolph Model 5550 or equivalent
11. 10cc Calibration Syringe, Hans Rudolph Model 5520 or equivalent, PN: 550032

6.2 Procedure

6.2.1 Power Supplies

1. With the monitor off, remove the bottom cover to expose the internal circuit boards. Refer to "Disassembling the Monitor" on page 25.
2. Measure the following voltages. Use TP4 as ground reference.

Signal Name	Location	Voltage	Tolerance
BVDD	TP15	5.10 Vdc	± 100 mV
THERM	TP16	2.25 Vdc	± 50 mV

3. Press the **POWER** key on the monitor.
4. Measure the following voltages. Use TP2 as ground reference.

Signal Name	Side	Location	Voltage	Tolerance
F5V	Front	IC19 pin 28	5.10 Vdc	± 100 mV

TP_POS_12V	Front	IC16 pin 8	12.0 Vdc	+100 mV - 300mv
TP_NEG_12V	Front	IC16 pin 4	-11.5 Vdc	± 500 mV
TP_AVCC	Front	TP1	5.00 Vdc	± 25 mV
TP_AVCC_2	Front	TP2	2.50 Vdc	± 25 mV
TP_1.47V	Front	TP3	1.47 Vdc	± 25 mV
NEG_AVCC_2	Back	IC24 pin 4	2.50 Vdc	± 25 mV

5. Measure the voltage at IC7 pin 3 on the 2741-01 board. Verify 5.00 Vdc ± 100 mV.
6. Monitor IC11 pin 8. Verify a voltage < 4.1 Vdc.
7. Monitor IC11 pin 10. Verify 0 VDC.
8. Monitor IC11 pin 14. Verify a switching pulse with a frequency of approximately 85 KHZ.
   Note: The frequency, pulse width, and period will change depending on the battery charge status.
9. Using a clip lead short TP15 to TP16. Verify the switching frequency at IC11 pin 14 changes from approximately 85 KHZ to < 50 HZ. Verify IC1 pin 10 goes high.

6.2.2 Airway Pressure Calibration

10. Press the **POWER** key to turn the unit off.
11. Press and *hold* the **DATA** key, then press the **POWER** key to power up the unit in the engineering menu.
12. Press the **GRAPH** (next) key until the selection arrow is pointing to “CALIBRATE” on the display. Press the **DATA** (select) key to enter the Calibration screen.

    Note: The second line of the calibration screen (Paw) has 2 parameters. They are (in order):

    PAW_ADU The A/D counts reading for the airway pressure channel.

    PAW The airway pressure in cmH_2O.

1. Press the **GRAPH** (ZERO) key.
2. Connect the Common Mode Test Adapter to the unit and to the Pennwalt. Adjust the Pennwalt to 90 cmH_2O.
   Note: The pressure settings for the Airway Pressure adjustment is stated in cmH_2O. Use the Inner scale on the Pennwalt when setting the pressure to cmH_2O.
3. Adjust VR4 until the PAW reading matches the Pennwalt reading of 90 cmH_2O.
4. Press the **GRAPH** (ZERO) key.
5. Repeat steps 3 and 4 until the PAW reading is within ± 0.5 cmH_2O as read from the Pennwalt meter.
6. Disconnect the Common Mode Test Adapter.

6.2.3 Differential Pressure Calibration

Note: The calibration screen displays 2 columns of values for the x1, x10, x100, and x1000 channels of the differential pressure sensor. They are (in order):

ACTUAL_CNTS	The actual A/D counts for the respective channel.
DIFF_CNTS	The difference between the actual A/D counts and the A/D counts at the zero point.

1. Connect the 6936-48 Differential Test Adapter to the 2740-01 board.
2. Press the **GRAPH** (ZERO) key.
3. Connect the Pennwalt to the positive pressure port (blue tube).
4. Adjust the Pennwalt to 11 cmH_2O.
5. Adjust VR1 until the x1 channels DIFF_CNTS reads 887 counts.
6. Press the **GRAPH** (ZERO) key.
7. Repeat steps 5 and 6 until the x1 channels DIFF_CNTS is 887 counts ± 2 counts.
8. Switch the Pennwalt's output from the positive port to the negative port (clear tube) of the Differential test fixture.
9. Verify the x1 channel reads -887 counts ± 25.
10. Disconnect the Differential Test Adapter.

6.3 Barometric Pressure Calibration

Perform the following only if the barometric pressure reading of the monitor does not match the currrent barometric pressure as recorded from a calibrated barometer. This procedure requires adjustments for offsets within the electronic circuitry and must be performed accurately and carefully.

1. Connect the 6937-48 Common Mode Test Adapter to the monitor.
2. Press and *hold* the **DATA** key, then press the **POWER** key to power up the unit in the engineering menu.
3. Press the **GRAPH** (next) key until the selection arrow is pointing to "CALIBRATE" on the display. Press the **DATA** (select) key to enter the Calibration screen.
4. **Note:** The top line of the calibration screen (Pbar) has 3 parameters displayed. They are (in order):

BARO_ADU	The A/D counts reading for the barometric pressure channel
ADDED_PRESSURE	The applied gage pressure (mmHg) to the unit. This parameter must be read after a ZERO. Changing the offset or span will make this number meaningless until the next zero.
BARO_PRESSURE	The TOTAL pressure (mmHg). Barometric plus added pressure. With no pressure applied, this will equal the barometric pressure.

5. Adjust VR3 so that the BARO_ADU reading is about 1000 counts.

6. Press the **GRAPH** (ZERO) key.
7. Connect the Pennwalt pneumatic calibrator to the Common Mode Test Adapter.
8. Adjust the Pennwalt for an output pressure of 50 mmHg.
   Note: The pressure settings for the Barometric Pressure adjustments are stated in mmHg not cmH_2O. Use the outer scale on the Pennwalt when setting the pressure to mmHg.
9. Adjust VR2 until the ADDED_PRESSURE reading is 50 (you may need to readjust VR3 if BARO_ADU becomes greater than 3500 counts).
10. Press the **GRAPH** (ZERO) key.
11. Repeat steps 9 and 10 until the ADDED_PRESSURE is within ± 2 mmHg of the Pennwalt setting.
12. Adjust the Pennwalt for an output pressure of 100 mmHg.
13. Adjust VR2 until the ADDED_PRESSURE reading is 100.
14. Press the **GRAPH** (ZERO) key.
15. Repeat steps 13 and 14 until the ADDED_PRESSURE is within ± 1 mmHg of the Pennwalt setting.
16. Disconnect the Pennwalt from the Common Mode Test Adapter.
17. Press the **GRAPH** (ZERO) key.
18. Obtain the current Barometric Pressure from the calibrated Barometer.
19. Adjust VR3 until the BARO_PRESSURE value matches the Barometric pressure obtained from the calibrated Barometer.
20. Press the **GRAPH** (ZERO) key.
21. Repeat steps 19 and 20 as needed.

Section 7 Maintenance

7.1 General

This section presents recommended maintenance schedules for the Model 101 and information on general maintenance, such as battery replacement, disassembly and assembly instructions, and system software updates.

7.2 Maintenance Schedules

The electronic circuits within the Model 101 do not require scheduled calibration or service. However, in order to maximize battery life, the monitor's internal battery should be tested monthly. Novametrix recommends the following maintenance schedules.*

- Cleaning and Sterilization:
  Perform as required. See Cleaning and Sterilization on page 22.
- Battery and AC Operation:
  Contains information on use of disposable alkaline and rechargeable batteries. See Battery and AC Operation on page 22.
- Functional Tests:
  The test verifies overall functional integrity of the monitor and sensor. See Functional Tests on page 13.
- Accuracy Tests:
  The test verifies the calibration accuracy of the monitor using specified test apparatus. See Accuracy Tests on page 15.
- Electrical Tests:
  These tests contain information on testing the electronic circuits within the Model 101 and should only be performed if the monitor fails to pass the Functional and or Accuracy Tests. Only qualified service personnel should attempt to perform the Electrical Tests. See Electrical Tests on page 17.

*. At the customer's request, Novametrix will provide repair and calibration services under terms of a Service Contract. Contact the Novametrix Service Department for contract details.

7.3 Cleaning and Sterilization

Follow the cleaning and sterilization instructions listed below to clean and/or sterilize the monitor and its accessories.

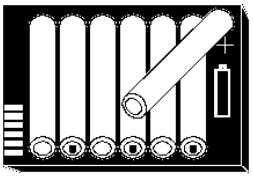
CAUTION

The airway adapter is designed for single patient use. Sterilizing may affect system performance.

- Turn the monitor off and disconnect from any other devices before cleaning.
- Do not immerse the monitor.
- Do not attempt to sterilize the monitor.
- The monitor can be cleaned and disinfected with solutions such as a 70% isopropyl alcohol, 2% glutheralhyde, or 10% bleach solution. Then wipe down with a water-dampened clean cloth to rinse. Dry before use.
- Treat Series 3 Flow Sensors in accordance with hospital protocol for single-patient use items.

7.4 Battery and AC Operation

The Model 101 can be powered from seven "AA" disposable alkaline batteries or a rechargeable battery. Battery capacity is shown in the chart below. Times may be reduced in colder temperatures or with power cycling; operation with the backlight off may slightly increase these times. Any batteries used with the 6862-00 case cannot be charged, it is for use with disposable type batteries only.

Power Source	Standard AA alkaline batteries (7 ea. - disposable)	Optional Rechargeable battery, (NiMH 7.2 vdc)
		
Capacity, continuous	8 hours	12 hours
Recharge Time	n/a	4.5 hours
Catalog Number	400038 (battery) 6862-00 (case)	400043

AA Alkaline Batteries. To power Model 101 from AA alkaline batteries, insert seven disposable alkaline batteries (Panasonic AM3X or equivalent) into the Battery Case (Cat. No. 6862-00) following the polarity markings on the case.

WARNING:

Do not recharge or incinerate alkaline batteries. Attempting to do so may cause the batteries to leak or explode.

Rechargeable Battery. Model 101 can operate from the optional NiMH (or equivalent) rechargeable battery. If a rechargeable battery has not been used for three months or more, recharge it before use.

WARNING:

Battery can explode, leak or catch on fire if heated or exposed to fire or high temperatures.

NOTE:

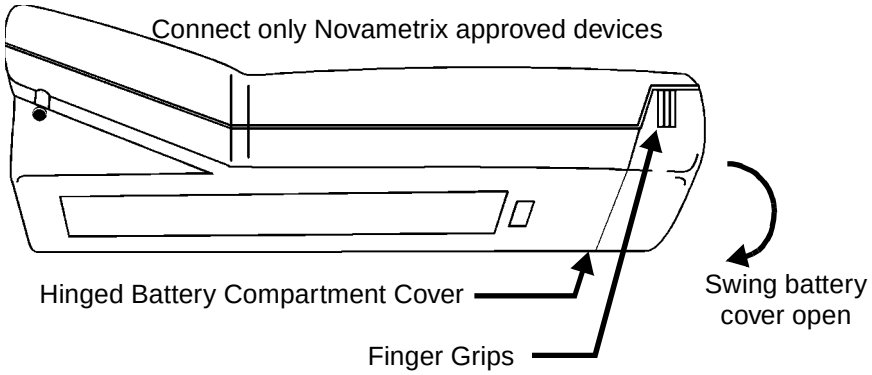
- New batteries, or batteries stored for extended periods of time may need to be fully charged and discharged up to five (5) times before performing at full capacity.
- With a new battery, or a battery that has not been used for 30 days, charge the battery for 24 hours prior to use.
- Refer to instructions packaged with rechargeable battery for complete operating instructions.

Additional Battery Information.

- Dispose of batteries in accordance with local laws.
- Do not mix battery types (e.g. disposable and rechargeable AA batteries).
- Model 101 may not power up if the batteries are nearly depleted.

7.4.1 Battery Installation

To install or remove the battery, grasp the finger grips on each end of the Model 101 battery cover. Squeeze together and pull so that the hinged cover opens. The battery is keyed and can be installed in only one orientation (see illustration inside battery compartment). The contacts should go in first and be located toward the top left of the monitor. Close the battery cover before operating the monitor.



7.4.2 External Battery Charger

An optional external charger for the NiMH rechareable battery pack is available. The external charger allows the battery to be recharged outside of the Model 101 monitor.

- The external charger is for use with the rechargeable NiMH battery only.
- In a non-patient area, connect the external charger to an AC source. Remove the battery from the Model 101 and insert it into the external charger. The battery will be fully charged in approximately 4.5 hours.
- Refer to the instructions supplied with the charger for additional information.

WARNING:

The external battery charger should NOT be operated near or in close proximity to patients and/or other medical equipment in operation.

7.4.3 Features Connector

Located on the enclosure rear is a six pin modular contact which provides a power input for unit operation and battery charging when connected to Novametrix accessories. This connector meets the patient safety requirements of the following agencies: IEC 601-1, UL544, and TUV.

7.5 Assembly Exchanges

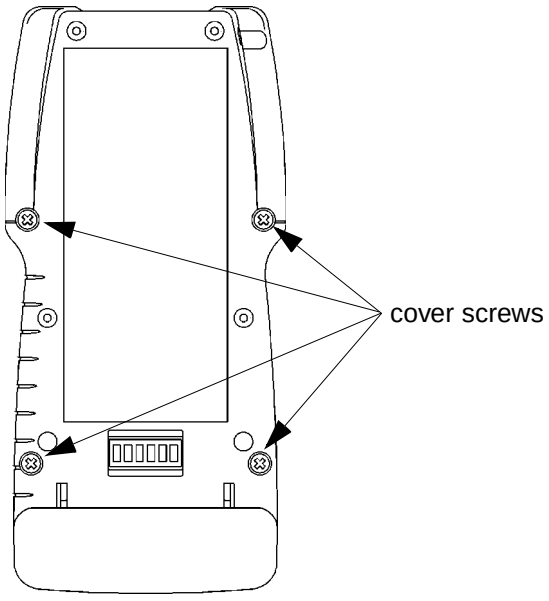
The disassembly instructions below are intended as a guide to enable component exchanges if necessary. There are no user serviceable parts inside. Disassembly should be performed by qualified service personnel only.

CAUTION

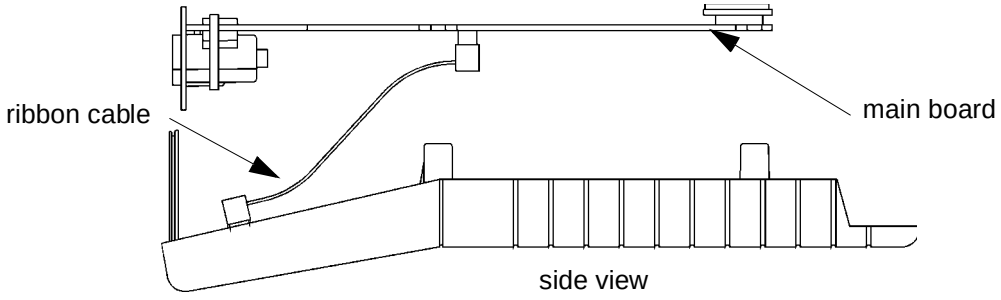
The Model 101 contains static sensitive devices. Be sure to follow proper grounding procedures when handling the internal components to avoid damage from static discharge.

7.5.1 Disassembling the Monitor

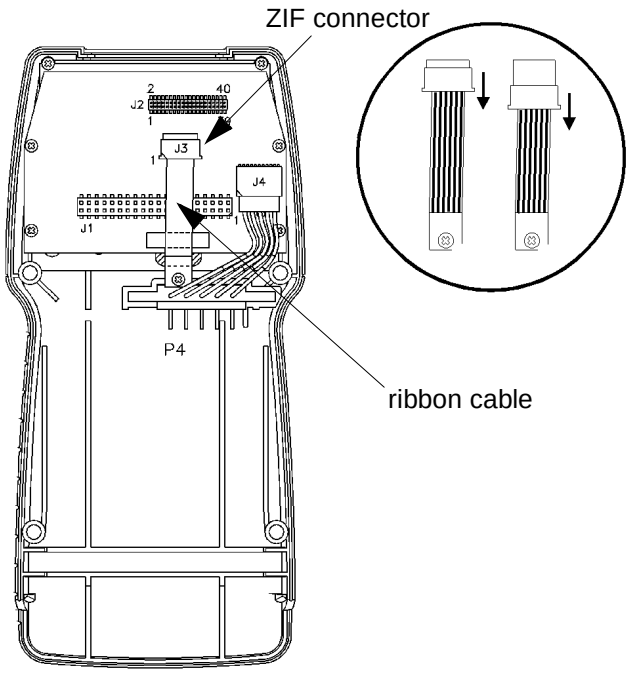
1. Ensure that the monitor is OFF. Remove the battery pack.
2. Turn the monitor upside down and remove the four cover screws from the bottom cover.



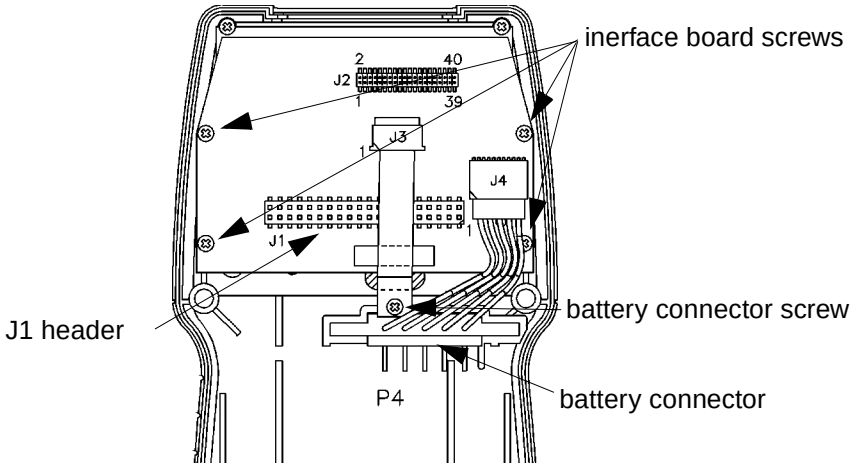
3. Carefully lift the rear cover from the monitor. The separate assemblies of the monitor can now be removed.
4. Lift the Main Board and disconnect ribbon cable from the Interface Board by grasping the connector (not the cable) and gently rocking from side to side to loosen. Be careful not to bend any pins when pulling the connector off of the header strips.



5. Remove the Main Board.
6. The Interface Board and battery connector can now be accessed.
7. To disconnect ribbon cable J3, grasp the edge of the ZIF (zero insertion force) connector with one forefinger on either side. Pull gently *sideways* to release the mechanism. Slide the ribbon cable out.

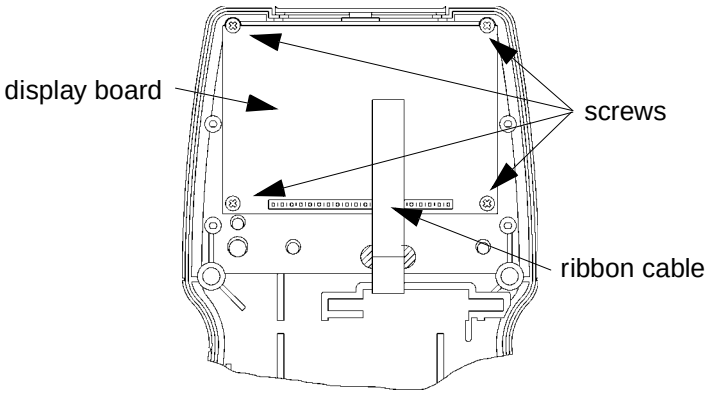


8. Remove four screws from the Interface Board. Disconnect the screw on the battery connector (black and red wires).



9. Slide the battery connector out of the bracket and remove the interface board, rocking gently to release the header strip J1 which connects through the Interface Board from the Display Board below.

10. Remove 4 screws holding the Display Board in place. Do not bend the tabs on the board, the LCD display can not be removed from the board. Be sure not to lose the plastic bezel located in between the LCD display and the display window.



7.5.2 Reassembling the monitor

1. Check the inside of the display window and the LCD display for dirt/finger prints, clean if necessary. Replace the plastic bezel around the display window. Set the Display Board in place and secure with 4 screws.
2. Place the battery connector (red and black wires) into the bracket and push in. Secure in place with 1 screw.
3. Place the Interface Board in the case, taking care to align the pins at header strip J1 underneath—line the LEDs up with the openings in the case, this will give you a point of reference. When you are sure the pins are lined up with the holes, gently push down, do not force. Place the strain relief section on the sensor cable into the egress slot, push down to lock in.
4. Secure the Interface Board with 4 screws.
5. Slide ribbon cable J3 into the ZIF locking connector, pushing gently to be sure that the cable is as far into the locking mechanism as possible. Push the connector closed to lock in the ribbon cable. Pull lightly on the ribbon cable to ensure that it is secure.
6. Replace ribbon cable from the Main Board to the Interface Board and align the main board with the standoffs.
7. Ensure the battery gasket is set in place, refer to the assembly print 6800-01 (page 3) for placement. Place the back cover on the monitor. Secure with 4 screws.
8. Opened hinged cover and replace the rechargeable battery or battery pack. Battery is keyed to fit in only one direction. When the monitor is powered it will default to the factory default settings.

Section 8 *Accessories*

Cat. No.	Description
Monitor (English language)	
6800-00	*VENT*✔ Handheld Respiratory Mechanics Monitor, Model 101
6800-23	User's Manual
6800-90	Service Manual
	VENT✔ Quick Guide Inservice Video
420037	VHS video tape, NTSC format (U.S.A.)
420038	VHS video tape, PAL format
420039	VHS video tape, SECAM format
Flow Sensors	
6717-00	Series 3, Pediatric/Adult Flow Sensor. 10/Box
6718-00	Series 3, Neonatal Flow Sensor. 10/Box
6720-00	Series 3, Neonatal Combined CO_2/Flow Sensor. 10/Box
Power Options	
6862-00	Battery Case for AA Batteries (batteries not included)
400038	Alkaline Battery, 1.5 vdc, AA Size (Panasonic AM3X or equivalent)
400043	Rechargeable Battery, NiMH, 7.2V, 2.4AH, (Duracell® DR30 or equivalent)
400049	External Battery Charger (DR30), Universal Voltage, NiMH (power line cord not included)
600026	Power Line Cord, 120 vac, (U.S.A.) for External Battery Charger
Miscellaneous	
140084	Pole/Shelf Mount Kit
315107	Carrying Case

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Section 9 *Parts Lists*

9.1 6800-00 Final Assembly, Model 101

LINE	PART NO	REV	QPA	DESCRIPTION
0001	6800-01	02	1	MAIN ASSY, MODEL 101 - VENTCHECK
0002	6800-04	XX	0	TEST PROCEDURE, SYSTEM, MODEL 101 - VENTCHECK
0003	6800-09	P0	0	OVERALL WIRING DIAGRAM, MODEL 101 - VENTCHECK
0004	6800-23	02	1	USERS MANUAL, MODEL 101 - VENTCHECK
0005	6800-33	XX	0	ASSY PROCEDURE, SHIPPING INSTRUCTIONS, MODEL 101
0006	6800-40	00	0	DESIGN DOCUMENTATION, MODEL 101 - VENTCHECK
0007	6800-43	XX	0	DATA SHEET, MODEL 101 - VENTCHECK
0008	6800-75	02	0	DEVICE MASTER RECORD, MODEL 101 - VENTCHECK
0009	6835-32	00	1	LABEL, PATIENT ISOLATION, MODEL 101
0010	6874-32	00	1	LABEL, SERIAL NO. & BATTERY ALIGNMENT
0011	6877-32	00	1	QUICK GUIDE LABEL, BOTTOM COVER, MODEL 101
0012	6886-13	00	1	CARTON, SHIPPING, HAND HELD MONITOR
0013	6920-13	00	1	SHIPPING CARTON, ACCESSORIES, HAND HELD MONITOR
0014	6965-32	00	1	REGULATORY LABEL, UL MARK FOR USA & CANADA
0015	9026-32	01	1	LABEL, "MANUFACTURED IN USA"
0019	240059		0	SCREW COVER, BLK, PVC, .25DIA X .06T, ACRYLIC
0020	315033		0	POUCH, PLASTIC, ZIP LOCK, 4" X 6", 2 MIL THICK

9.2 6800-01 Main Assembly, Model 101

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2740-01	01	1	MAIN BOARD ASSY, MODEL 101 - VENTCHECK
0002	2741-01	00	1	INTERFACE BOARD ASSY, MODEL 101 - VENTCHECK
0003	6680-13	01	1	BOTTOM COVER W HOLE AND SHIELDING, HAND HELD
0004	6685-16	00	1	BATTERY DOOR, HAND HELD ENCLOSURE
0005	6773-10	00	1	SHIELD, MYLAR, BOTTOM COVER, MODEL 101
0006	6823-10	01	1	FILLER, KEYPANEL
0007	6824-27	01	1	MEMBRANE KEYPANEL, MODEL 101 - VENTCHECK
0008	6838-10	01	1	GASKET, BATTERY DOOR
0009	6839-10	00	1	GASKET, BATTERY
0010	6855-13	00	1	TOP COVER WITH SHIELDING, MODEL 101
0012	161082		0	TAPE, UHMW POLYETHYLENE, .002 THK
0013	161102		0	ADHESIVE, RTV162, SILICONE, WHITE
0014	160044		0	ALCOHOL, ISOPROPYL, TECHNICAL GRADE
0015	281211		0	SCREW, 2-56 X 1/4L, SELF TAPPING, BINDING HEAD
0016	286223		0	SCREW, 6-32 X 3/8 IN. L, PAN HD, PHILLIPS, ST
0017	482605		1	LCD DISPLAY, W LED BACKLIGHT & CONN W GOLD PL
0018	600068		1	RIBBON CABLE, 40 PIN, RCPT TO RCPT, 3.5 IN. L
0019	600518		1	BATTERY INTERCONNECTION CABLE, 5 PIN, 2.3 IN.

9.3 2740-01 01 Main Board Assy, Model 101

PART NO	REV	QPA	DESCRIPTION
161102		0	ADHESIVE, RTV162, SILICONE, WHITE
2740-03	01	0	SCHEMATIC, MAIN BOARD, MODEL 101 - VENTCHECK
2740-04	XX	0	TEST PROCEDURE, MAIN BOARD, MODEL 101
2740-17	01	1	MAIN BOARD SUBASSY, MODEL 101 - VENTCHECK
487128		1	IC, DUXL01D, DIFF PRESSURE SNSR, 1 IN, H20, 4
608012		0	CABLE TIE, SELF-LKG, .094W X 8L, 1/16 TO 2" B
6837-10	01	1	GASKET, CONNECTOR CRADLE, MODEL 101
6961-01	01	1	FLOW CONNECTOR AND TUBING ASSY, 101
6962-07	12	1	PROGRAM, EPROM ASSY, SYSTEM, 101 - VENTCHECK

9.4 2740-17 01 Main Board Subassy, Model 101

PART NO	REV	QPA	DESCRIPTION
130015		1	TRANSDUCER, AUDIO, 2400 HZ, 12V, 40MA, .5 DIA
154062		23	CAPACITOR, .01UF, 50V, 10%, X7R, SURFACE MOUNT
154072		59	CAPACITOR, .1UF, 50V, 10%, X7R, CER CHIP, S M
154078		1	CAPACITOR, 1000PF, 50VDC, 10%, NPO, MONO CERA
154079		7	CAPACITOR, 10UF, 25V, 10%, TANTALUM, SURFACE
154080		8	CAPACITOR, 47UF, 10VDC, 10%, TANTALUM, SURFAC
154081		1	CAPACITOR, 100PF, 100V, 10%, NPO, MLTILYR CER
154082		2	CAPACITOR, 22PF, 100V, 10%, NPO, MLTILYR CERA
154093		2	CAPACITOR, 68UF, 16VDC, 10%, TANTALUM, SURF M
180022		3	INDUCTOR, 10UH, 10%, SURFACE MOUNT
180029		15	INDUCTOR, 50MHZ CUT-OFF FREQUENCY, SURFACE MO
180030		2	INDUCTOR-CAP, 4700PF, 50VDC, 2A, 3 TERM, SURF
180046		1	INDUCTOR, 18UH @ 2.5M HZ, +25% -15%, SURFACE
180047		4	INDUCTOR, 50 OHMS @ 100M HZ, 3A, 1206 STYLE,
210141		1	CONNECTOR, DC PWR JACK, SOLDER TERM, PC/PNL M
211415		1	CONNECTOR, 4 PIN, HEADER, .079 SP, R ANG, PC
213412		1	CONNECTOR, 40 PIN, HEADER, DIL, STR, .05 SP,
215073		1	SOCKET, PLCC, 32 PIN, .05 SP, LOW PROFILE, S
216029		0	TEST POINT, SPRING LOADED, 475 DEG C MAXIMUM
230027		1	CRYSTAL, 12.00 MHZ, .192 SP, HC-49/US STYLE,
250146		2	VALVE, SOLENOID, 5V, 0-30 PSIG, 10 PSID MAX,
2739-01	00	1	BATTERY & COMM INTERFACE BOARD ASSY, MODEL 61
2740-02	01	1	FAB, MAIN BOARD, MODEL 101 - VENTCHECK
474127		1	RESISTOR, 511K OHM, 1/8W, 1%, SURFACE MOUNT
474136		11	RESISTOR, 1K OHM, 1/8W, 1%, SURFACE MOUNT
474137		3	RESISTOR, 1M OHM, 1/8W, 1%, SURFACE MOUNT
474138		30	RESISTOR, 100 OHM, 1/8W, 1%, SURFACE MOUNT
474141		2	RESISTOR, 249K OHM, 1/8W, 1%, SURFACE MOUNT
474152		2	RESISTOR, 3.01K OHM, 1/8W, 1%, SURFACE MOUNT
474157		3	RESISTOR, 511 OHM, 1/8W, 1%, SURFACE MOUNT
474161		1	RESISTOR, 5.9K OHM, 1/8W, 1%, SURFACE MOUNT
474165		26	RESISTOR, 10K OHM, 1/8W, 1%, SURFACE MOUNT
474166		19	RESISTOR, 100K OHM, 1/8W, 1%, SURFACE MOUNT
474170		2	RESISTOR, 301K OHM, 1/8W, 1%, SURFACE MOUNT
474182		2	RESISTOR, 150K OHM, 1/8W, 1%, SURFACE MOUNT
474185		1	RESISTOR, 150 OHM, 1/8W, 1%, SURFACE MOUNT

PART NO	REV	QPA	DESCRIPTION
474186		1	RESISTOR, 15K OHM, 1/8W, 1%, SURFACE MOUNT
474211		7	RESISTOR, 49.9K OHM, 1/8W, 1%, 1206 STYLE, S
474216		1	RESISTOR, 4.99K OHM, 1/8W, 1%, 1206 STYLE, SR
474220		7	RESISTOR, ZERO OHM, 1/4W, 5%, 1206 STYLE, SUR
474263		1	RESISTOR, 28K OHM, 1/8W, 1%, 1206 SIZE, SURF
474273		1	RESISTOR, 14.7K OHM, 1/8W, 1%, 1206 STYLE, SU
474274		8	RESISTOR, 20K OHM, 1/8W, 1%, 1206 STYLE, SURF
474275		2	RESISTOR, 1.5K OHM, 1/8W, 1%, 1206 STYLE, SUR
474277		1	RESISTOR, .15 OHM, 1/2W, 2010 STYLE, SURFACE
474278		1	RESISTOR, 237K OHM, 1/8W, 1%, 1206 STYLE, SUR
474279		1	RESISTOR, 562 OHM, 1/8W, 1%, 1206 STYLE, SURF
474280		1	RESISTOR, 243 OHMS, 1/8W, 1%, 1206 STYLE, SUR
474281		1	RESISTOR, 71.5K OHM, 1/8W, 1%, 1206 STYLE, SR
474282		1	RESISTOR, 4.64K OHM, 1/8W, 1%, 1206 STYLE, SR
474285		1	RESISTOR, 255 OHM, 1/8W, 1%, 1206 STYLE, SURF
474287		6	RESISTOR, 200K OHM, 1/8W, 1%, 1206 STYLE, SUR
474288		2	RESISTOR, 499 OHM, 1/8W, 1%, 1206 STYLE, SURF
474289		1	RESISTOR, 8.06K OHM, 1/8W, 1%, 1206 STYLE, SR
474290		1	RESISTOR, 12.1K OHM, 1/8W, 1%, 1206 STYLE, SR
474291		1	RESISTOR, 34K OHM, 1/8W, 1%, 1206 STYLE, SURF
474293		1	RESISTOR, 40.2K OHM, 1/8W, 1%, 1206 STYLE, SU
475050		3	POTENTIOMETER, 20K OHM, 10%, M TURN, T ADJ, S
475052		1	POTENTIOMETER, 1K OHM, 10%, TOP ADJ, M-TURN,
481045		1	DIODE, ZENER, BZT52-C5V1, 5.1V
481546		10	DIODE, MMBD914L, SWITCHING, SURFACE MOUNT
481547		1	DIODE, BAT54, HOT CARRIER SCHOTTKY, SURFACE M
481549		2	DIODE, MBRS140T3, RECTIFIER, SURFACE MOUNT
481552		3	DIODE, MBRS340T3, SCHOTTKY, 40V, 3A, SURFACE
481555		2	DIODE, MMBD7000LT1, DUAL SWITCHING, SURFACE M
483019		2	TRANSISTOR, MMBT2907ALT1, PNP, SOT-23, SURFAC
483020		1	TRANSISTOR, FMMT717, PNP, SOT23 CASE, SURFACE
484060		3	TRANSISTOR, MMBT3904T, NPN, SURFACE MOUNT
485532		6	TRANSISTOR, 2N7002T1, N-CHAN ENHAN MODE, SURF
485543		1	TRANSISTOR, SI9939DY, MOSFET, N-CH & P-CH, -2
486042		1	IC, AT93C66-10SC, SERIAL 4K EEPROM, 8 PIN, SR
486306		1	IC, MCM60L256AF10, 32K X 8 CMOS SRAM, 100NS
486317		2	IC, MC74HC00AD, QUAD 2-IN NAND GATE, SURFACE
486323		1	IC, SN74HC573DW, OCTAL D-TYPE LATCH W 3-ST OU
486349		1	IC, MC74HC08AD, QUAD 2 INPUT AND GATE, 14 PIN
486351		1	IC, S80C196KB-16, 16 BIT MICROCONTROLLER
486353		1	IC, CS82C55A, PROGRAMABLE PERIPH INTFC, 8MHZ,
486354		1	IC, LTC1384CS, L PWR RS232 RECEIVER, 18 PIN,
486481		1	IC, TLC5620CD, QUAD 8-B D-TO-A CNVRTR, 14 P,
486785		1	IC, LP339M, QUAD VOLTAGE COMPARATOR, ULTRA-LO
486808		1	IC, AD680JR, 2.5 VOLTAGE REF, L PWR, 8 PIN S
486811		1	IC, TLC2262AIDR, DUAL OP AMP, RAIL TO RAIL, S
486820		1	IC, BQ2004SN, FAST CHARGE, 16 PIN, SURFACE MO
486821		9	IC, AD822AR, FET-IN OP AMP, L POWER, 8 PIN, S
486824		1	IC, MC74HC4024D, BINARY RIPPLE CNTR, 7-STAGE,
487108		1	IC, TL7757CD, VOLTAGE SUPERVISOR, 8 PIN, S MN
487115		3	IC, AD620BR, INSTR AMPLIFIER, L PWR, 8 PIN, S

PART NO	REV	QPA	DESCRIPTION
487124		3	IC, ERT-3281, REFLECTIVE SENSOR, H SPD, 4 PIN
487126		1	IC, SCC30AD4, PRESSURE SNSR, 30 PSIA, 6 PIN,
515087		1	FUSE W FUSEHOLDER, 1A, 125V, SLO-BLO, SUBMIN,
515090		1	FUSE, 2A, 63V, VERY FAST-ACTING, THIN FILM, S

9.5 2739-01 00 Battery & Comm Interface Board Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2739-02	00	1	FAB, BATTERY & COMM INTERFACE BOARD, MODEL 101
0002	2739-03	00	0	SCHEMATIC, BATTERY & COMM INTERFACE BD, MODEL 101
0008	211512		2	CONNECTOR, 5 PIN, HEADER, STRAIGHT, .1 SP, PC MNT
0009	211638		1	CONNECTOR, 6 PIN, RECEPTACLE, MOD CONTACT

9.6 2741-01 00 Interface Board Assy, Model 101

PART NO	REV	QPA	DESCRIPTION
152096		6	CAPACITOR, 220UF, 35V, 20%, ELCTLT, 8X10.8 CA
154062		4	CAPACITOR, .01UF, 50V, 10%, X7R, SURFACE MOUN
154072		3	CAPACITOR, .1UF, 50V, 10%, X7R, CER CHIP, S M
154079		2	CAPACITOR, 10UF, 25V, 10%, TANTALUM, SURFACE
154081		1	CAPACITOR, 100PF, 100V, 10%, NPO, MLTILYR CER
154114		3	CAPACITOR, .022UF, 50V, 10%, X7R, 1206 SIZE,
180022		3	INDUCTOR, 10UH, 10%, SURFACE MOUNT
180043		1	FERRITE BEAD, 30 OHMS AT 100MHZ, 0603 STYLE,
211514		1	CONNECTOR, 5 PIN, HEADER, RT ANGLE, .1 SP, PC
211639		1	CONNECTOR, 6 PIN, RCPT, ZIF, R ANG, .05 SP, P
213411		1	CONNECTOR, 40 PIN, RCPT, PASS THRU, DIL, STR,
213412		1	CONNECTOR, 40 PIN, HEADER, DIL, STR, .05 SP,
216029		0	TEST POINT, SPRING LOADED, 475 DEG C MAXIMUM
2741-02	01	1	FAB, INTERFACE BOARD, MODEL 101 - VENTCHECK
2741-03	00	0	SCHEMATIC, INTERFACE BOARD, MODEL 101 - VENT
2741-04	00	0	TEST PROCEDURE, INTERFACE BOARD, MODEL 101
280233		0	SPACER, LED, FOR 2 LEADS, .2 DIA X .1 LONG, B
280234		0	SPACER, LED, FOR 3 LEADS, .255 DIA X .185 L,
280235		0	SPACER, LED, FOR 2 LEADS, .25 DIA X .2 LONG,
474136		6	RESISTOR, 1K OHM, 1/8W, 1%, SURFACE MOUNT
474165		7	RESISTOR, 10K OHM, 1/8W, 1%, SURFACE MOUNT
474166		1	RESISTOR, 100K OHM, 1/8W, 1%, SURFACE MOUNT
474174		4	RESISTOR, 332 OHM, 1/8W, 1%, SURFACE MOUNT
474186		1	RESISTOR, 15K OHM, 1/8W, 1%, SURFACE MOUNT
474220		1	RESISTOR, ZERO OHM, 1/4W, 5%, 1206 STYLE, SUR
474274		1	RESISTOR, 20K OHM, 1/8W, 1%, 1206 STYLE, SURF
474276		1	RESISTOR, 866K OHM, 1/8W, 1%, 1206 STYLE, SUR
481546		2	DIODE, MMBD914L, SWITCHING, SURFACE MOUNT
481549		1	DIODE, MBRS140T3, RECTIFIER, SURFACE MOUNT
482601		1	LED, YELLOW, ROUND, .100 SPACING, PC MOUNT
482602		1	LED, GREEN, ROUND, .100 SPACING, PC MOUNT
482604		1	LED, BICOLOR, RED & GREEN, ROUND, 3 LEAD, PC
484558		1	VOLTAGE REGULATOR, LTC1144CS8, SW CAP, 8 PIN,
484572		2	VOLTAGE REGULATOR, LT1129CST-5, 3 PIN, SURFAC

PART NO	REV	QPA	DESCRIPTION
485532		2	TRANSISTOR, 2N7002T1, N-CHAN ENHAN MODE, SURF
486314		1	IC, MC74HC541DW, OCTAL BUFFER/LINE DRVR-RCVR
486323		2	IC, SN74HC573DW, OCTAL D-TYPE LATCH W 3-ST OU
487125		1	IC, LT1302CS8, DC-DC CONVERTER, 8 PIN, SURFAC
515087		1	FUSE W FUSEHOLDER, 1A, 125V, SLO-BLO, SUBMIN,

9.7 6935-48 00 Test Fixture, Flow Leak Test

LINE	PART NO	REV	QPA	DESCRIPTION
0002	6653-72	01	1	PNEUMATIC CONNECTOR, PLUG, MULTIPORT
0003	8921-10	00	0	DUAL TUBING, 96 IN. LONG, FLOW SENSOR
0010	160038		0	SOLVENT,50% CYCLOHEXANONE & 50% TETRAHYDROFUR
0012	250111		1	FITTING, QIK DISC FEM LUER, 1/8 ID TUBING, NYLON
0013	250149		1	FITTING, T-CONNECTOR, 1/16 TO 1/8, NYLON
0014	250150		1	STOPCOCK, 3-WAY, WITH MALE LUER ADAPTER
0015	315095		1	SYRINGE, 5CC, DISPOSABLE, WITH LUER LOK
0016	608106		0	TUBING, VINYL, .125(3.2) ID, .250(6.4) OD, 68

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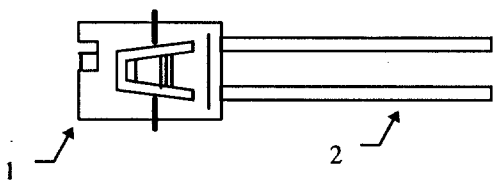
Section 10 *Drawings and Schematics*

Below is a list of schematics and drawings for the Model 101 (Cat. No. 6800-00).

Drawing No.	Code	Title	Sheets
6936	48	Differential Test Adapter	1
6937	48	Common Mode Test Adapter	1
6935	48	Test Fixture, Flow Leak	1
6800	09	Overall Wiring Diagram	1
6800	00	Flow Monitor, Vent Check	1
6800	01	Main Assembly, Model 101	3
2740	01	Main Board Assembly	1
2740	03	Main Board Schematic	9
2741	01	Interface Board Assembly	1
2741	03	Interface Board Schematic	2



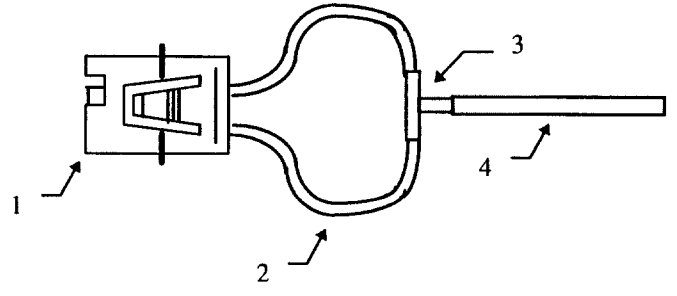
PARTS LIST

NUM	PART #	DESCRIPTION
1	6653-72	FLOW SENSOR CONNECTOR, ADULT
2	8921-10	DUAL TUBING, 2.5" LENGTH

NOTES:

1. SEPARATE THE DUAL TUBING.
2. SOLVENT BOND THE DUAL TUBING TO THE 6653-72 USING A 50/50 MIX OF THF AND CYCLOHEXANONE

NOVAMETRIX MEDICAL SYSTEMS INC.	
DRAWING: 6936-48 DIFFERENTIAL TEST ADAPTER	
DRAWN BY: Michael Cassarino	REV
DATE: March 14, 1998	00



PARTS LIST

NUM	PART #	DESCRIPTION
1	6653-72	FLOW SENSOR CONNECTOR, ADULT
2	8921-10	DUAL TUBING, 2.5" LENGTH
3	250134	"Y" FITTING
4	250114	TUBING, 1/16" ID x 1"

NOTES:

1. SEPARATE THE DUAL TUBING.
2. SOLVENT BOND THE DUAL TUBING TO THE 6653-72 USING A 50/50 MIX OF THF AND CYCLOHEXANONE
3. ASSEMBLY THE REMAINING PIECES AS SHOWN ABOVE

NOVAMETRIX MEDICAL SYSTEMS INC.	
DRAWING: 6937-48 COMMON MODE TEST ADAPTER	
DRAWN BY: Michael Cassarino	REV
DATE: March 14, 1998	00

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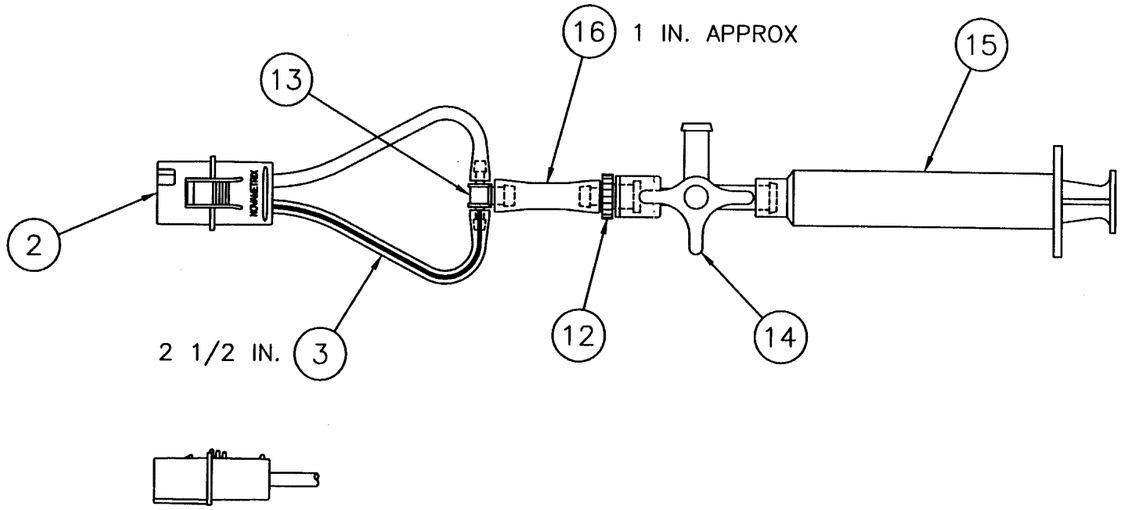

NOTES:

1. ASSY PROCEDURE:
   A. CUT DUAL TUBING (ITEM 3) APPROXIMATELY AS SHOWN AND SPLIT ALONG THE ENTIRE LENGTH.
   B. ON CONNECTOR END ONLY: DIP END OF TUBING WITH BLUE STRIPE IN 50:50 MIX OF THF/CYCLOHEXANONE, ITEM 10 FOR 1 SECOND. BLOT END OF TUBING ON ABSORBENT TOWEL TO DRAW SOLVENT OUT OF TUBING BORE AND INSERT INTO CONNECTOR (ITEM 2). NOTE ORIENTATION.
   C. REPEAT PROCEDURE FOR CLEAR TUBING AND ALLOW TO DRY.
   D. CONNECT DUAL TUBING TO THE T-CONNECTOR FITTING (ITEM 13).
   E. PRESS 1/4 DIA TUBING (ITEM 16) ONTO T-CONNECTOR FITTING.
   F. INSERT QUICK DISCONNECT FEMALE LUER FITTING (ITEM 12) INTO 1/4 DIA TUBING.
   G. SECURE STOPCOCK (ITEM 14) TO QUICK DISCONNECT FEMALE LUER FITTING.
   H. SECURE SYRINGE (ITEM 15) TO STOPCOCK.
   J. PERMANENTLY MARK PART NO. INCLUDING CURRENT REV ON CONNECTOR APPROX AS SHOWN.

REV	R NO.	DATE

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES
.X ±.02 TOLERANCES
.XX ±.01
.XXX ±.005 FRAC ±1/64
.XXXX ±.0010 ANG ±1/4°

MATERIAL ~

FINISH ~

TITLE: TEST FIXTURE, FLOW LEAK, 2ND GENERATION

DRAWN	CHECKED
BL 18Jul97	MRL 12Sep97
MFG ENGR MJC 9/12/97	APPROVED MJ 9/12/97

USED ON: ~

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
C	6935	48	00

SCALE: 1/1 SHEET 1 OF 1

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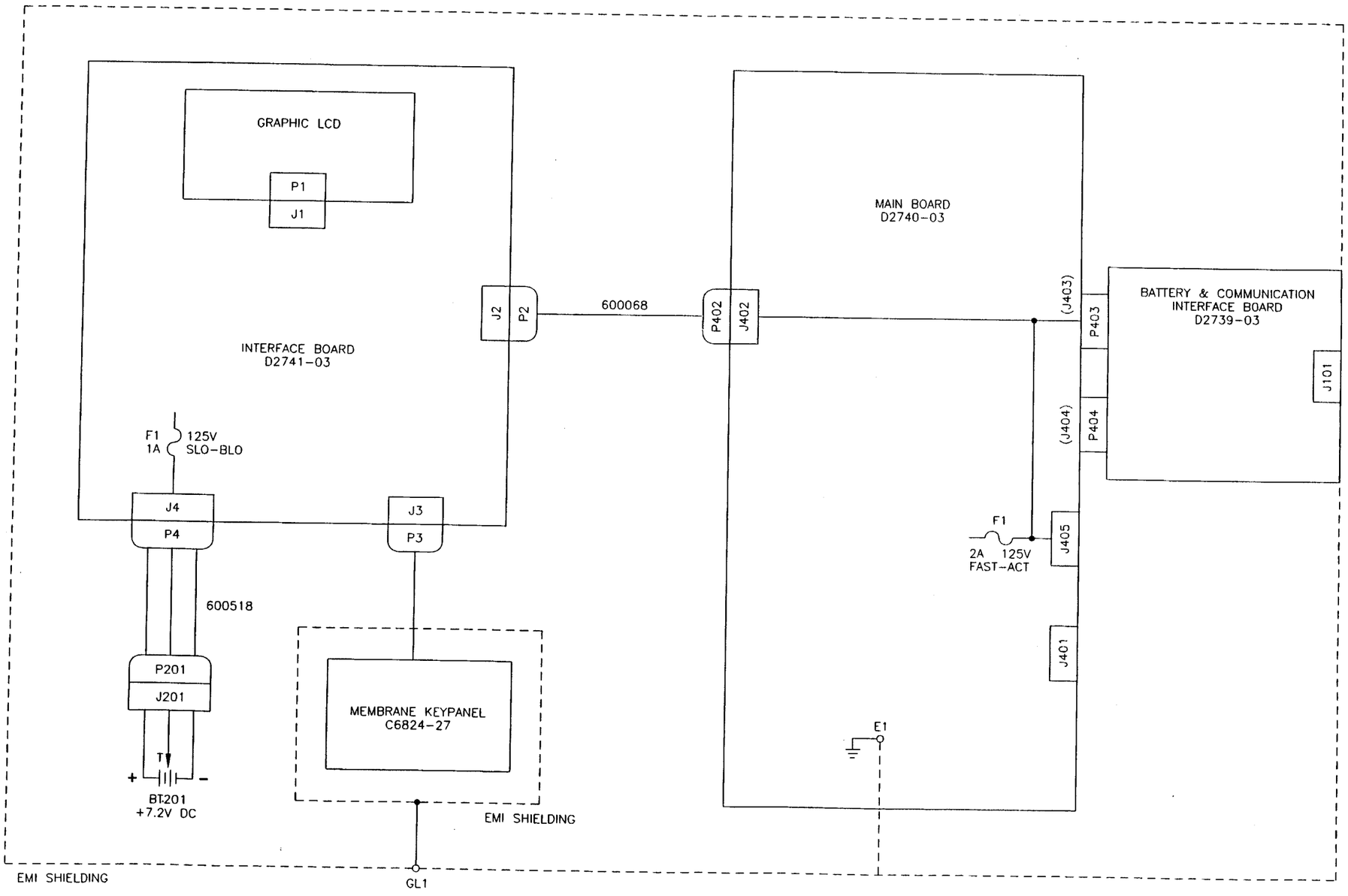

REV	R NO.	DATE	

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± —
FRAC ± —
MIXED ± .007 - .003 (mm) (±.18 - .08)
ANG ± —
MATERIAL ~
FINISH ~
USED ON 04700-00

TITLE
OVERALL WIRING DIAGRAM, MODEL 101 - VENT CHECK

DRAWN 2/23/96 Michael P Lindsay
CHECKED
MFG ENGR
APPROVED
5/29/96

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO	CODE	REV
D	6800	09	00

SCALE NONE SHEET 1 OF 1

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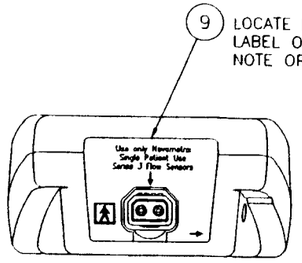
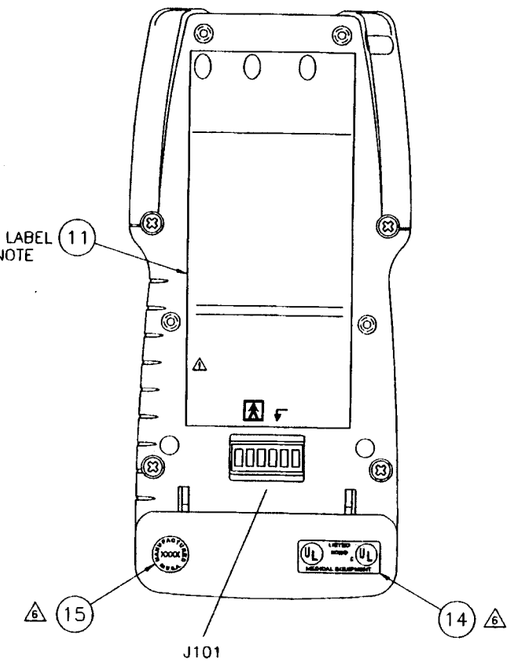
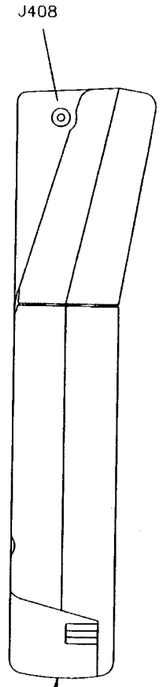
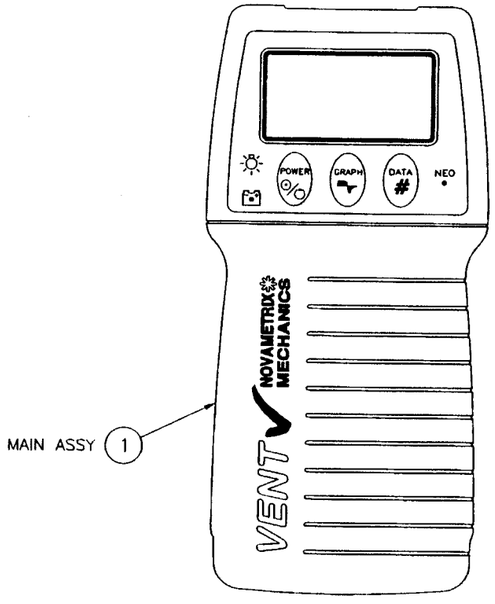
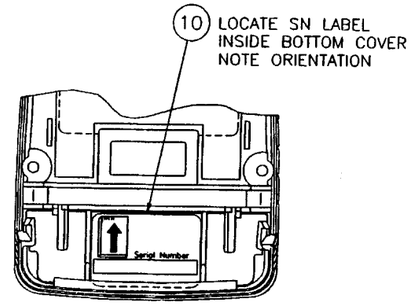

9
LOCATE PATIENT ISOLATION LABEL ON TOP COVER NOTE ORIENTATION
Use only Novametrix Single Patient Use Series 3 Flow Sensors









DETAIL A

NOTES:

1. FOR SYSTEM TEST PROCEDURE SEE A6800-04.
2. FOR QA TEST PROCEDURE SEE A6800-70.
3. FOR SHIPPING INSTRUCTIONS SEE A6800-33.
4. FOR OVERALL WIRING DIAGRAM SEE D6800-09.
5. THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH MONITOR. REFER TO SHIPPING INSTRUCTIONS.
   A. ITEM 4: USERS MANUAL; QTY: 1
   B. ITEM 19: SCREW COVER, BLACK; QTY: 6 (PLACE IN POUCH)
   C. ITEM 20: POUCH, PLASTIC, ZIP LOCK; QTY: 1

6 LOCATE LABELS APPROXIMATELY AS SHOWN.

REV	R NO.	DATE
02	N546	12Feb98
01	N529	24Nov97

DO NOT SCALE UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) (± ~)
FRAC ± ~ (mm) (± ~)
HOLES +.007 -.003 (mm) (± ~)
ANG ± ~
MATERIAL ~
FINISH ~

TITLE: FLOW MONITOR, MODEL 101 – VENT CHECK

DRAWN	CHECKED
RGG 4Jun97	JAY 7/18/97
MFG ENGR BH	APPROVED AJE 7-17-97

USED ON: ~

NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	6800	00	02

SCALE: 1/1 SHEET 1 OF 1

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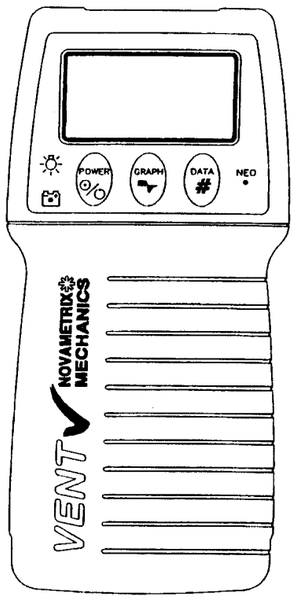

2ND: CONNECT RIBBON (18) CABLE FROM 2740 BOARD TO 2741–J2

(1) 2740 BOARD NOTE ORIENTATION

1ST: CONNECT RIBBON CABLE TO 2740–J402

SEE DETAIL A ON SHEET 2 FOR TOP COVER SUBASSY

SEE DETAIL C ON SHEET 3 FOR BOTTOM COVER SUBASSY

(16) SECURE TOP AND BOTTOM COVERS TOGETHER WHILE CAPTURING 2740 BOARD 4 PL

J101

REV	B NO	DATE
02	N546	12Feb98
01	N511	23Sep97

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± —
FRAC ± —
HOLES +.007 −.003 (mm) (± —)
ANG ± —
MATERIAL ~
FINISH ~

TITLE: MAIN ASSY, MODEL 101 – VENT CHECK

DRAWN BSG Sum97 | CHECKED JAT 7/18/97
MFG ENGR RH | APPROVED AJE 7-17-97
USED ON: 06809-00

NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO	CODE	REV
D	6800	01	02

SCALE 1/1 | SHEET 1 OF 3

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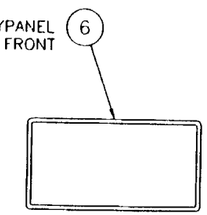
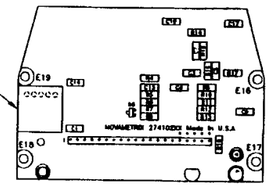
INSTALL KEYPANEL FILLER FROM FRONT (6)

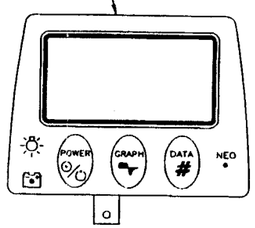


5/8 IN. X 5/8 IN. COVER J4 PINS WITH TAPE APPROX AS SHOWN. DO NOT COVER E19 CONDUCTIVE AREA (12)

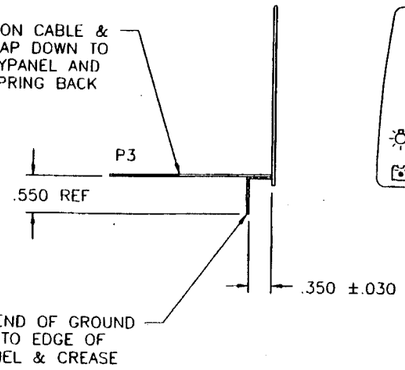


DETAIL E

ATTACH MEMBRANE KEYPANEL TO TOP COVER USING ADHESIVE BACKING (7)



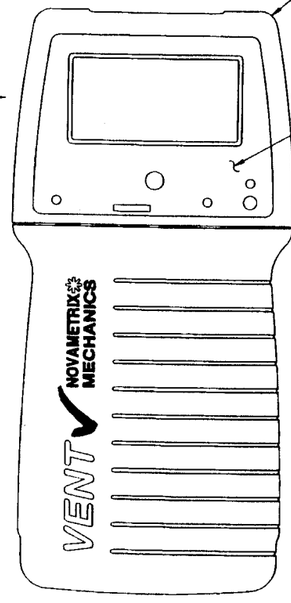
BEND RIBBON CABLE & GROUND STRAP DOWN TO REAR OF KEYPANEL AND ALLOW TO SPRING BACK



BEND END OF GROUND STRAP TO EDGE OF KEYPANEL & CREASE

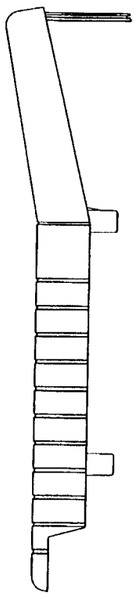
TOP COVER WITH SHIELDING (10)

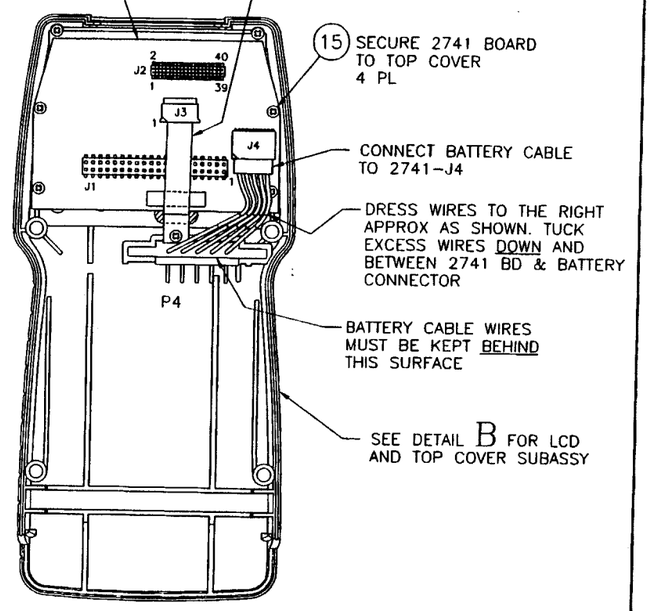
CLEAN KEYPANEL RECESS WITH ISOPROPYL ALCOHOL AND ALLOW TO DRY (14)



DETAIL A

SEE DETAIL E FOR 2741 BOARD SUBASSY (2)





CONNECT RIBBON CABLE FROM KEYPANEL TO 2741-J3

SECURE 2741 BOARD TO TOP COVER 4 PL (15)

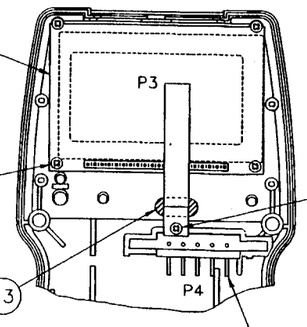
CONNECT BATTERY CABLE TO 2741-J4

DRESS WIRES TO THE RIGHT APPROX AS SHOWN. TUCK EXCESS WIRES DOWN AND BETWEEN 2741 BD & BATTERY CONNECTOR

BATTERY CABLE WIRES MUST BE KEPT BEHIND THIS SURFACE

SEE DETAIL B FOR LCD AND TOP COVER SUBASSY

INSTALL LCD DISPLAY NOTE ORIENTATION (17)



SECURE LCD DISPLAY TO TOP COVER. 4 PL (15)

SECURE BATTERY CABLE AND KEYPANEL GROUND STRAP (15)

APPLY A BEAD OF RTV COMPLETELY AROUND GROUND STRAP AND RIBBON CABLE INSURING THAT ALL VOIDS ARE FILLED. CURE AT ROOM TEMPERATURE FOR 24 HOURS (13)

BATTERY CABLE WIRES NOT SHOWN (19)

DETAIL B

REV	R NO.	DATE
02	N546	12Feb98
01	N511	23Sep97

DO NOT SCALE UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) (± ~)
FRAC ± ~ (mm) (± ~)
HOLES +.007 -.003 (mm) (± ~)
ANG ± ~
MATERIAL ~
FINISH ~

TITLE: MAIN ASSY, MODEL 101 - VENT CHECK

DRAWN RGG 5Jun97 | CHECKED JAT 7/18/97
MFG ENGR BN | APPROVED AJE 7-17-97
USED ON: 06800-00

NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	6800	01	02

SCALE: 1/1 | SHEET 2 OF 3

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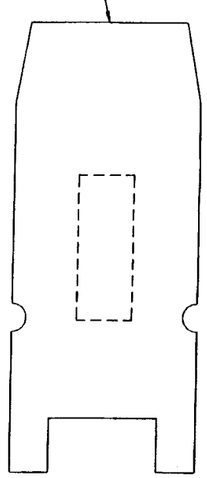
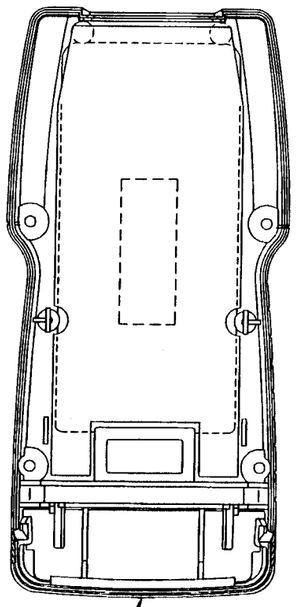
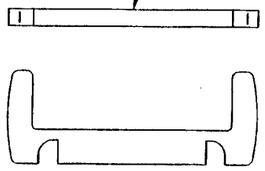
LOCATE SHIELD IN BOTTOM COVER AND SECURE USING ADHESIVE BACKING APPROX AS SHOWN (5)



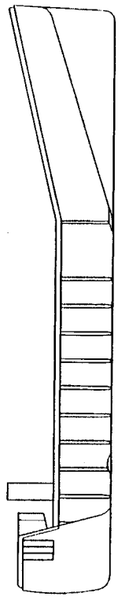


SEE DETAIL D FOR BATTERY DOOR SUBASSY

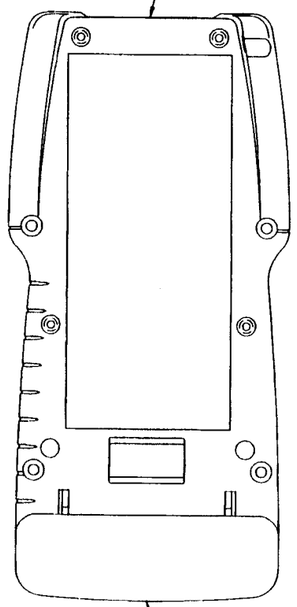
(9) LOCATE BATTERY GASKET IN BOTTOM COVER WITH ORIENTATION SHOWN



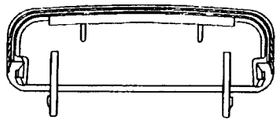
BOTTOM SIDE



(3) BOTTOM COVER WITH SHIELDING

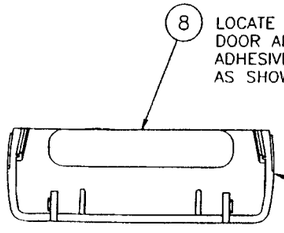


SNAP BATTERY DOOR ONTO BOTTOM COVER



DETAIL C

(8) LOCATE GASKET ON BATTERY DOOR AND SECURE USING ADHESIVE BACKING APPROX AS SHOWN



(4) BATTERY DOOR

DETAIL D

			DO NOT SCALE UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES TOLERANCES DEC ± .~ (mm) {± ~} FRAC ± .~ (mm) {± ~} HOLES ± .007 - .003 (mm) {± ~} ANG ± .~	TITLE MAIN ASSY, MODEL 101 – VENT CHECK	NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492		
			MATERIAL ~	DRAWN RGG 5Jun97	CHECKED JAT 7/18/97		
02	N546	12Feb98	FINISH ~	MFG ENGR BH	APPROVED AJF 7-17-97	SIZE D	DRAWING NO 6800
01	N511	23Sep97		USED ON P6800-20		CODE 01	REV 02
REV	E NO	DATE					

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PN	DESCRIPTION	REF DES
D2740-03	SCHEMATIC, MAIN BOARD, MODEL 101	~
A2740-04	TEST PROCEDURE, MAIN BOARD, MODEL 101	~
D2740-17	MAIN BOARD SUBASSY, MODEL 101	~
B6837-10	GASKET, CONNECTOR CRADLE, MODEL 610 & 101	(FOR 2739-J101)
C6961-01	FLOW CONNECTOR & TUBING ASSY, MODEL 101	~
A6962-07	PROGRAM, EPROM ASSY, SYSTEM	U21
161102	ADHESIVE, RTV162, SILICONE, WHITE	(FOR U29A)
487128	IC, DUXL01D, DIFF PRESSURE SENSOR	U29A
608012	CABLE TIE, SELF-LOCKING, .094 WIDE x 8 LONG	(FOR FLOW CONNECTOR)

SNAP FLOW SENSOR CONNECTOR INTO PC BOARD SLOTS APPROX AS SHOWN

CABLE TIE

SECURE FLOW SENSOR CONNECTOR TO PC BOARD USING CABLE TIE APPROX AS SHOWN

SEE DETAIL A FOR U29A PREP

CABLE TIE

U29A

DO NOT BLOCK VENT HOLE OR TUBING PORT WITH ADHESIVE. 2 PER SIDE

SEE PNEUMATIC DIAGRAM FOR TUBING POLARITY & TUBING CONNECTIONS

STRETCH TUBING ID FIRST AND THEN SECURELY HOLD U30 WHILE PRESSING TUBING ONTO PORT

U30

.27 ±.02

SECURE SENSOR TO BOARD WITH ADHESIVE. DO NOT COVER ANY COMPONENTS OR U29 MOUNTING HOLES.

U21 6962-07-XX Novametrix ©1997

273902XX J101

LOCATE CONNECTOR CRADLE GASKET OVER 2739-J101 WHILE NOTING ORIENTATION

U29A

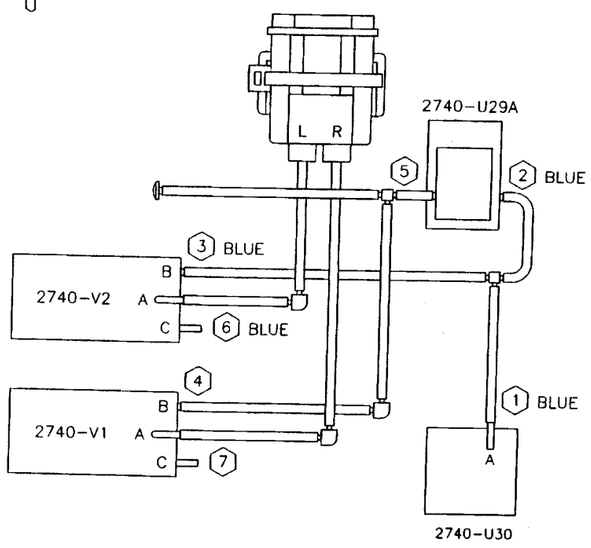
BEND SENSOR DOWN APPROX 90° AT LEAD TRANSITION POINT

REF LEAD TRANSITION POINT

PIN 1

DETAIL A

FLOW SENSOR CONNECTOR



NOTE: A. ALL PNEUMATIC ASSY ITEMS ARE PART OF THE FLOW CONNECTOR AND TUBING ASSY.
B. NOTE TUBING POLARITY WHEN MAKING CONNECTIONS.
C. ⬡ INDICATES ORDER OF TUBING CONNECTIONS

PNEUMATIC DIAGRAM

NOTES:
1. D2740-01 SPECIFICATIONS: FOR TEST PROCEDURE SEE A2740-04.

REV	R NO.	DATE
01	N529	24Nov97

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) (± ~)
FRAC ± ~ (mm) (± ~)
HOLES +.007 -.003 (mm) (± ~)
ANG ± ~
MATERIAL ~
FINISH ~

TITLE: MAIN BOARD ASSY, MODEL 101 - VENT CHECK

DRAWN MR Lieback 7/14/97 | CHECKED JAT 7/14/97
MFG ENGR BN 7-14-97 | APPROVED AJE 7-14-97
USED ON D6800-01

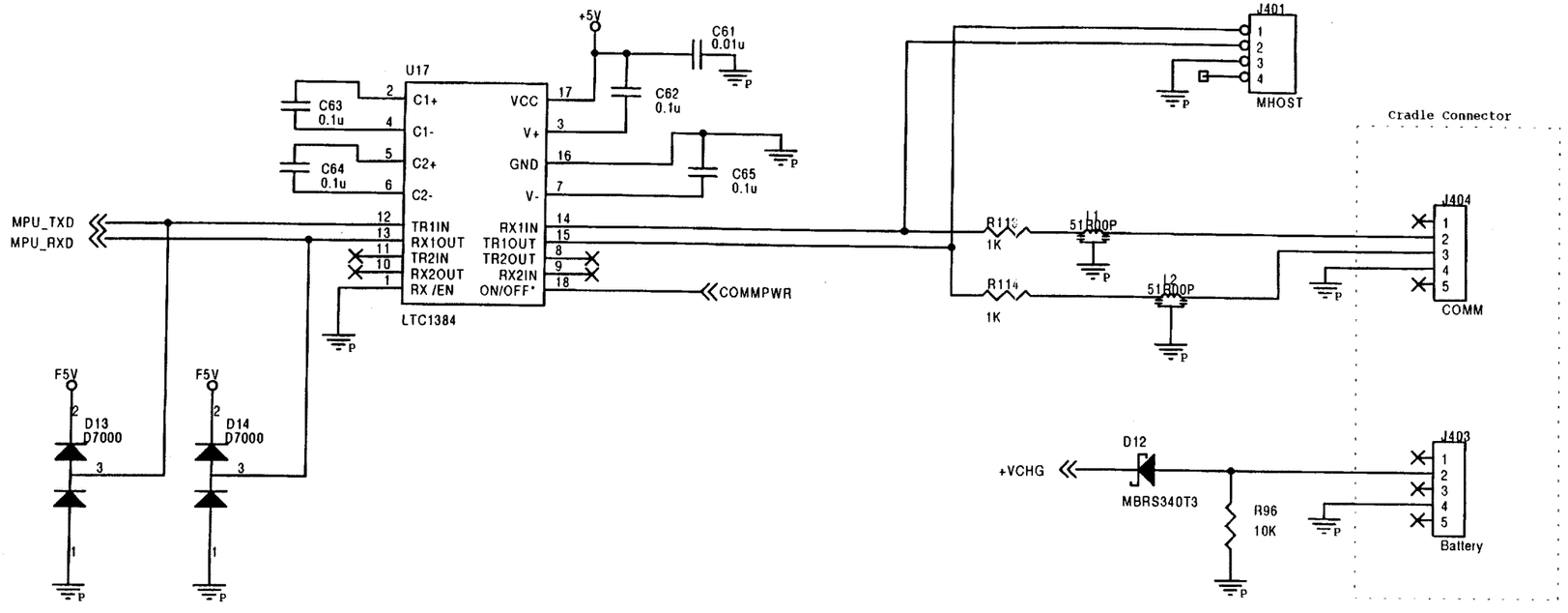
NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492

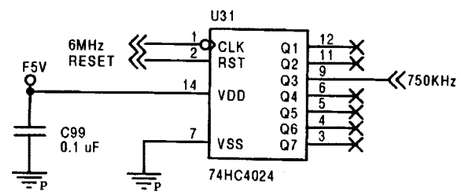
SIZE	DRAWING NO.	CODE	REV
D	2740	01	01

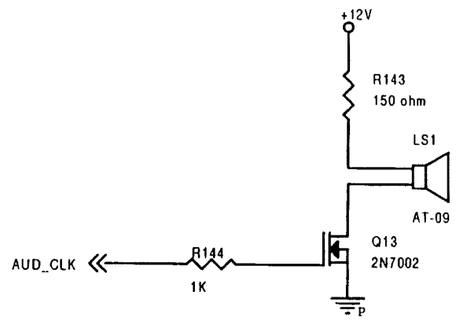
SCALE: 2/1 | SHEET 1 OF 1

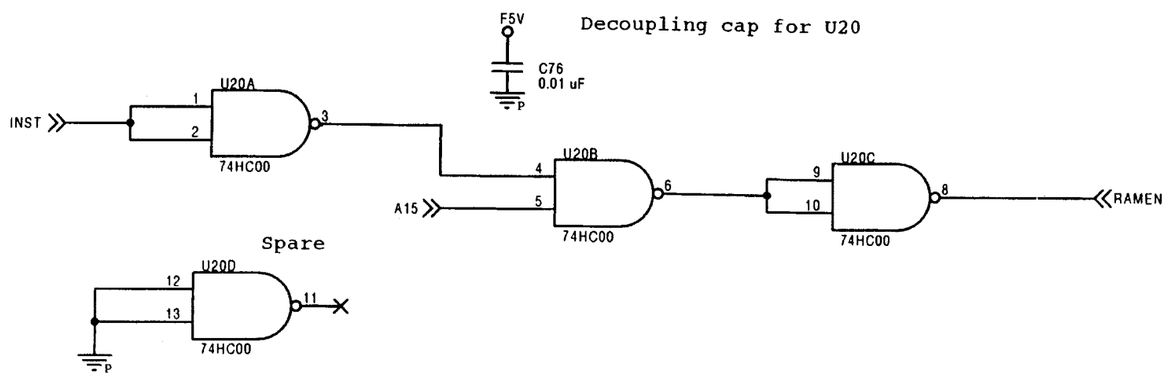
C70 0.01 uF C71 0.01 uF C72 0.01 uF F5V
C36 10 uf C37 0.1 uf C38 0.01 uf
U18 80C196KB-QFP
VPP, VCC x5, VSS x10
XTAL 2, XTAL 1, EA#, NMI, NC, READY, RESET#
22 pf C40, Y1 12 MHz, 22 pf C41
TP10 SRST*
8255_CS
L17 51R00P
AVCC V_REF
ACH_0 ACH 0 / P0.0
ACH_1 ACH 1 / P0.1
ACH_2 ACH 2 / P0.2
ACH_3 ACH 3 / P0.3
AWPRESS ACH 4 / PMODE.0 / P0.4
ABPRESS ACH 5 / PMODE.1 / P0.5
ACH 6 / PMODE.2 / P0.6
VBATTADC ACH 7 / PMODE.3 / P0.7
ANGND
R88 49.9k
R89 100k C43 0.1uF
P1.0 DAC_SDI
P1.1 DAC_LD
P1.2 DAC_CLK
P1.3 OCDRV_0
P1.4 OCDRV_1
P1.5 / BREQ# OCDRV_2
P1.6 / HLDA# POWER_HOLD
P1.7 / HOLD# VLV_CNTL
P3.0 / AD0 R121 0 ohm
P3.1 / AD1 R123 0 ohm
P3.2 / AD2 R122 0 ohm
P3.3 / AD3 D3
P3.4 / AD4 D4
P3.5 / AD5 D5
P3.6 / AD6 D6
P3.7 / AD7 D7
P4.0 / AD8 A8
P4.1 / AD9 A9
P4.2 / AD10 A10
P4.3 / AD11 A11
P4.4 / AD12 A12
P4.5 / AD13 A13
P4.6 / AD14 A14
P4.7 / AD15 A15
CLKOUT R120 0 ohm L16 51R00P
BHE# / WRH# R125 0 ohm
WR# / WL# R124 0 ohm
RD# L18 51R00P
ALE / ADV# L19 51R00P ALE
INST L24 51R00P INST
BUSWIDTH C96 100pf
TXD / PVER / P2.0 MPU_TXD
RXD / PALE# / P2.1 MPU_RXD
EXTINT / PROG# / P2.2
T2CLK / P2.3 750KHz
AINC# / T2RST / P2.4 EE_OUT
PWM / P2.5 L20 51R00P LED_PWM
T2UP-DN / P2.6 EE_CS
PACT# / T2CAPTURE / P2.7 COMMPWR
HSI.0 / SID.0
HSI.1 / SID.1
HSI.2 / HSO.4 / SID.2
HSI.3 / HSO.5 / SID.3 AUD_CLK
HSO.0
HSO.1
HSO.2
HSO.3
CLKOUT R145 0 ohm L25 51R00P 6MHz
U15 74HC573
OC, C, ALE
D0–D7, Q1–Q8
L22 51R00P
L21 51R00P
A0–A7 A[0..7]
D[0..7]
L13 51R00P
L14 51R00P
L15 51R00P
U21 AT29C512/010-90
A[0..15]
L23 51R00P
RAMEN
F5V
C42 0.1uF
A15
WR
RD
U19 MCM60L256AF10
32k x 8 SRAM
RAMCS
C39 0.01uF
Decoupling caps for U15, U29, and U27
C73 0.01 uF C74 0.01uF C75 0.01 uF
U28A U28B U28C U28D 74HC08
U27A U27B U27C U27D 74HC00
8255_CS
R138 100k
U25 93C66
EE_CS DAC_CLK DAC_SDI EE_OUT
C44 0.1uf
U26 TL7757
VDD RESET* GND
C45 0.1uF C46 10uF C47 0.01uF
R90 10k R86 10k
SRST* RESET
Q8 2N7002

MODEL 101 MAIN BOARD
Novametrix
Medical Systems, Inc.
1 Barnes Industrial Park Road
Wallingford, CT USA 06492
Drawn: A. Esposito Jan 8, 1997
Checked: MRL
Mfg Eng
Approved: AJE
Size B | Document Number 2740 | Code 03 | Rev 01
Rev. 01 | "R" No. N529 | By Date 12/24/97
File: 2740-03-00
Date: Monday, July 14, 1997
Sheet 1 of 9

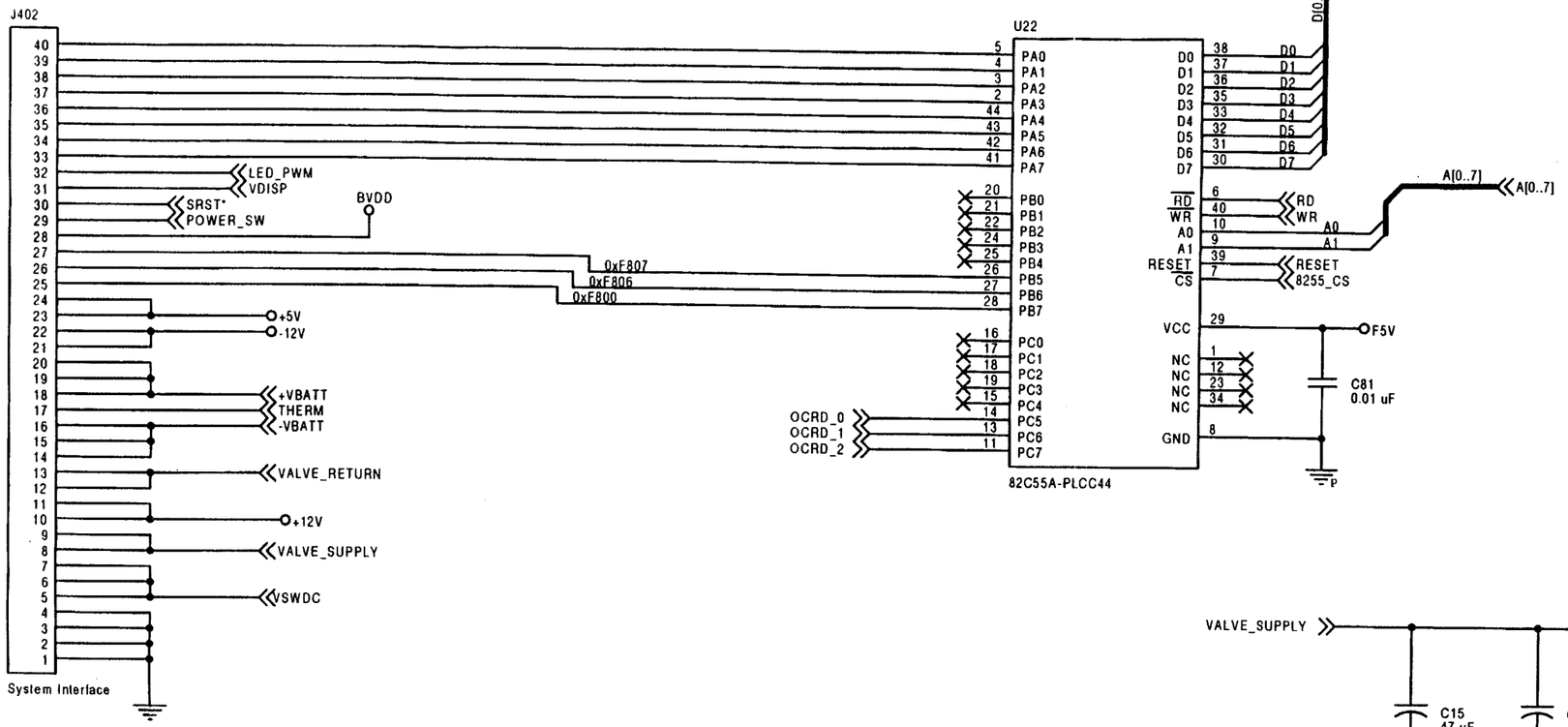


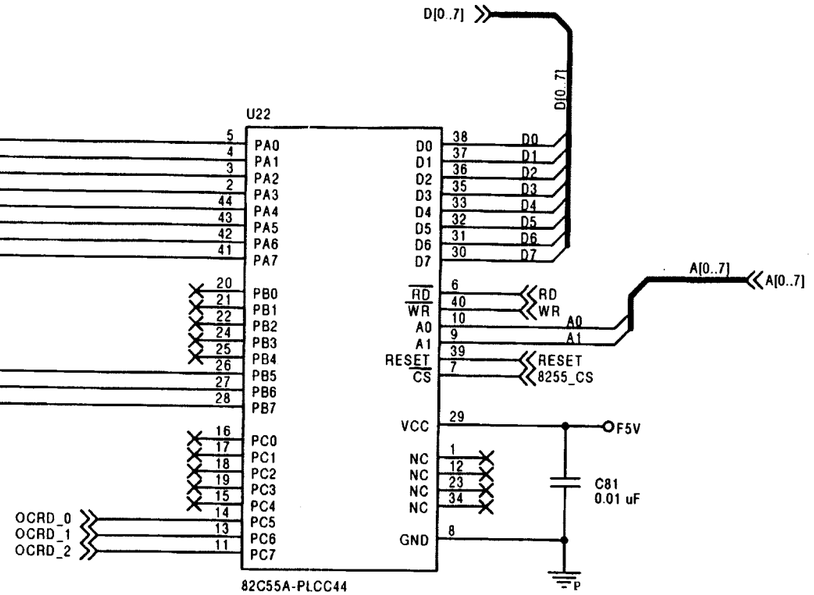




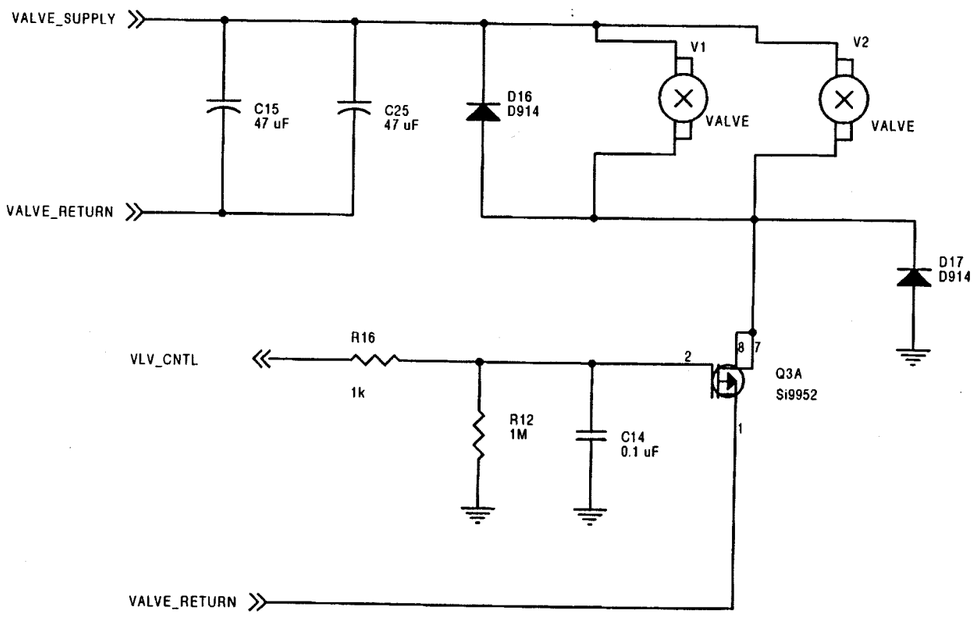


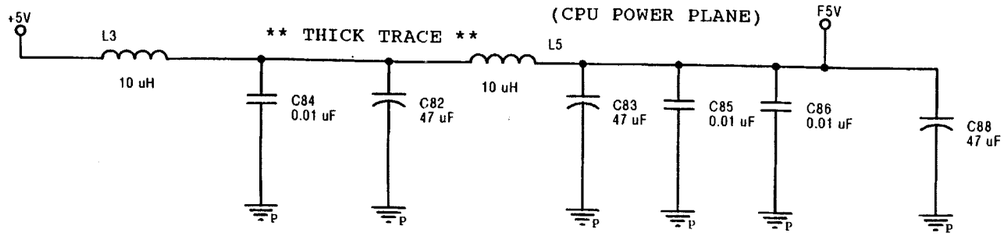
			MODEL 101 MAIN BOARD	Novametrix	
			Drawn A. Esposito Jan 8, 1997	Checked MRL	Medical Systems, Inc 1 Barnes Industrial Park Road Wallingford, CT USA 06492
			Mfg Eng	Approved AJE	Size B / Document Number 2740 / Code 03 / Rev 01
21	N523	12/24/37	File: 2740-03.00		Sheet 2 of 9
Rev.	"R" No.	By Date	Date: Monday, July 14, 1997		



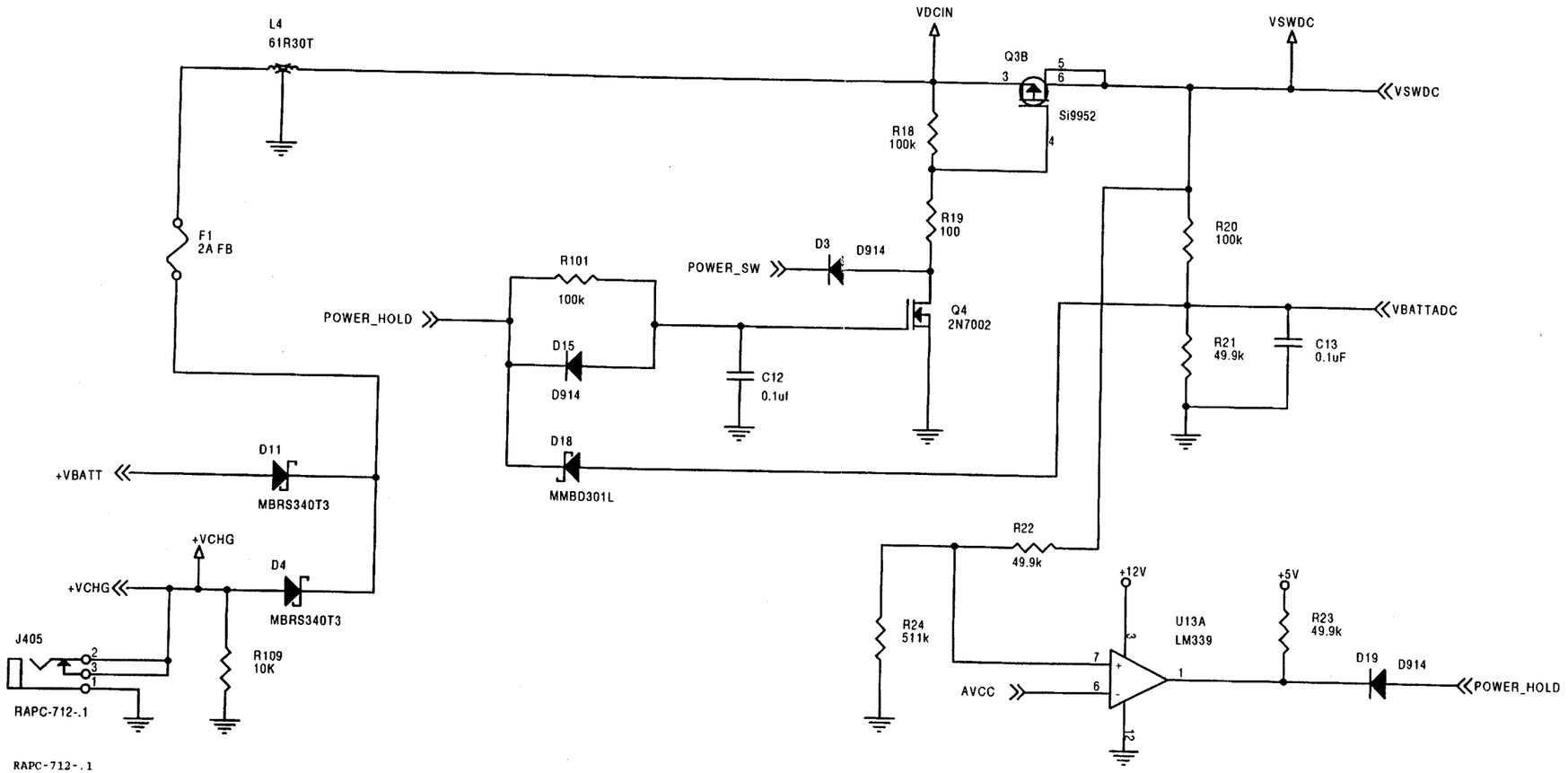


NOTE:
1.) UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS, 1/8W, 1%
CAPACITANCE VALUES ARE IN FARADS
INDUCTANCE VALUES ARE IN HENRY'S
2.) LAST REF DES USED: C103, D19, F2, ISO3, J405, L25,Q13, R150, TP17,U31,V2,VR4,Y1
3.) COMPONENTS NOT USED:

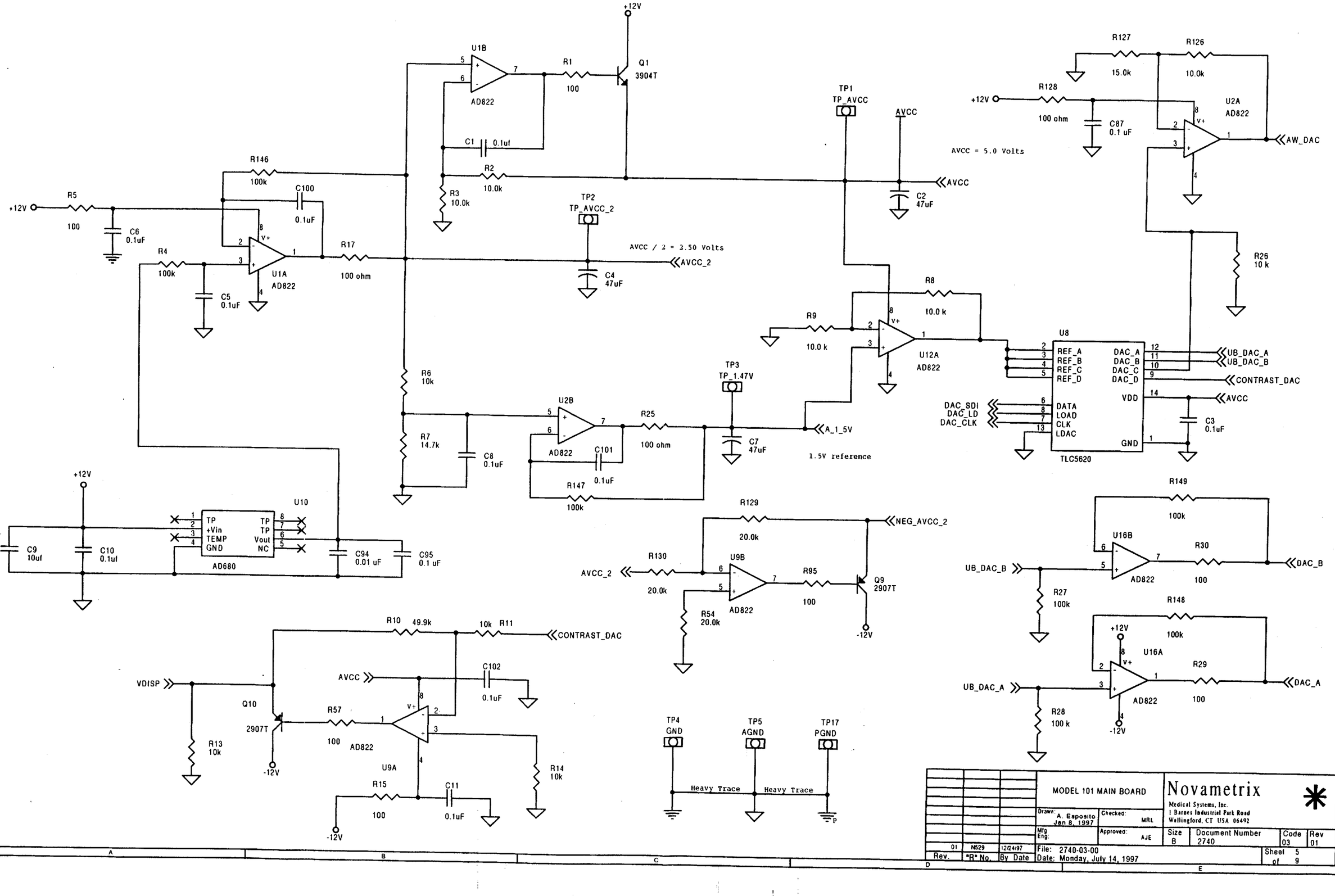




			MODEL 101 MAIN BOARD		Novametrix	
					Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492	
			Drawn: A. Esposito Jan 8, 1997	Checked: MRL		
			Mfg Eng:	Approved: AJE	Size B	Document Number 2740	Code 03	Rev 01
01	N523	12/24/97	File: 2740-03-00			Sheet 3 of 9
Rev.	"R" No.	By Date	Date: Monday, July 14, 1997			



			MODEL 101 MAIN BOARD	Novametrix	
			Drawn A. Esposito Jan 8, 1997	Checked MRL	Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492
			Mfg Eng	Approved AJE	Size B / Document Number 2740 / Code 03 / Rev 01
01	N529	12/24/97	File: 2740-03-00		Sheet 4 of 9
Rev.	"R" No.	By Date	Date: Monday, July 14, 1997		



			MODEL 101 MAIN BOARD	Novametrix	
			Drawn: A. Esposito Jan 8, 1997	Checked: MRL	Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492
			Mfg Eng:	Approved: AJE	Size B / Document Number 2740 / Code 03 / Rev 01
01	N529	12/24/97	File: 2740-03-00		Sheet 5 of 9
Rev.	"R" No.	By Date	Date: Monday, July 14, 1997		

VS (effective) = 6V

U29

SLP004DD4

C91 0.01 uF

R56 1.50k

-Out

+Out

L8 180047

L9 180047

L7 180047

L6 180047

VR1 20k

R59 1.0k

+12V

R60 100

C23 0.1uf

C89 0.01 uF

C90 0.01 uF

C24 0.1uf

R150 40.2k

U7B

AD822

R64 100

U14

AD620

R66 20k

R67 20k

C27 0.1uf

C28 0.1uf

C92 0.01 uF

C93 0.01 uF

NEG_AVCC_2

R69 100

C30 0.1uF

R70 10k

C48 0.01uF

R71 20k

R72 10k

+12V

R77 100

C33 0.1uF

AVCC

R79 4.99k

R80 249k

R81 1k

DAC_A

DAC_B

U6A

AD822

U6B

AD822

R53 3.01k

C18 0.1uF

C19 10uF

R52 100k

A_1_5V

C21 0.1uF

AMP04: POT=5k Rs=1k

AD620: POT=5k Rs=10

AVCC

U29A

-Out

+Out

DXL01D

Alternate Pressure Transducer.

R51 200k

C17 0.1 uf

AVCC

C20 0.1uf

AVCC_2

R131 100k

R132 200k

R133 100k

U5A

AD822AR

R55 100

TP6 FLOW 1

ACH_0

R58 200k

C22 0.1 uf

R61 10k

R63 200k

R65 10k

U5B

AD822AR

R62 100

TP7 FLOW 10

ACH_1

C26 0.1 uf

R68 200k

C29 0.1 uf

AVCC

C31 0.1uF

R73 1k

R75 200k

R76 1k

U4A

TLC2262

R74 100

TP8 FLOW 100

ACH_2

C32 0.1 uf

R78 1 M

C34 0.1 uf

R82 499

R84 1 M

R85 499

U4B

TLC2262

R83 100

TP9 FLOW 1000

ACH_3

C35 0.01 uf

MODEL 101 MAIN BOARD

Novametrix

Medical Systems, Inc.
1 Barnes Industrial Park Road
Wallingford, CT USA 06492

Drawn A. Esposito Jan 8, 1997 | Checked MRL | Mfg Eng | Approved AJE

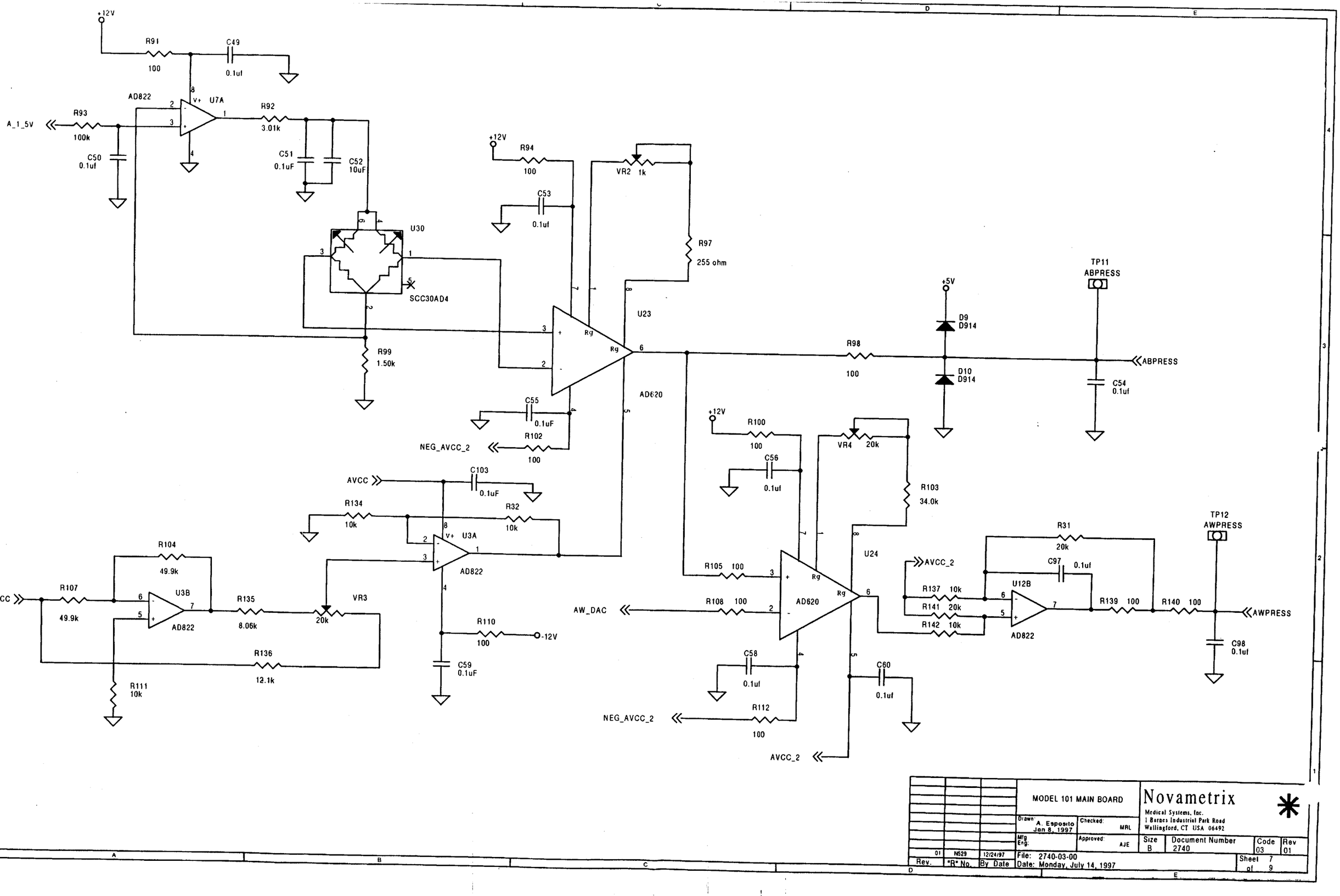
Size B | Document Number 2740 | Code 03 | Rev 01

Rev. | *R* No. | By | Date

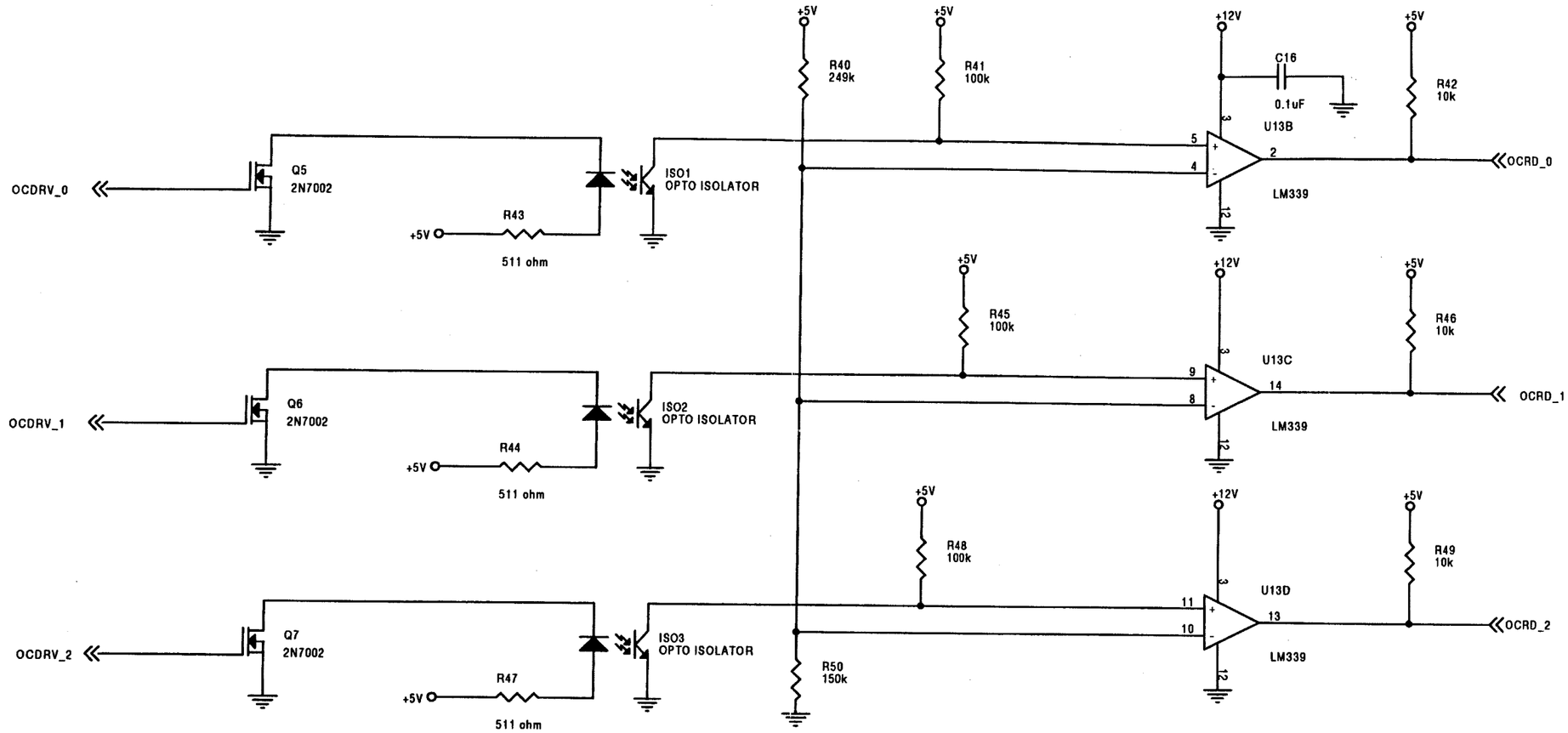
File: 2740-03-00

Date: Monday, July 14, 1997

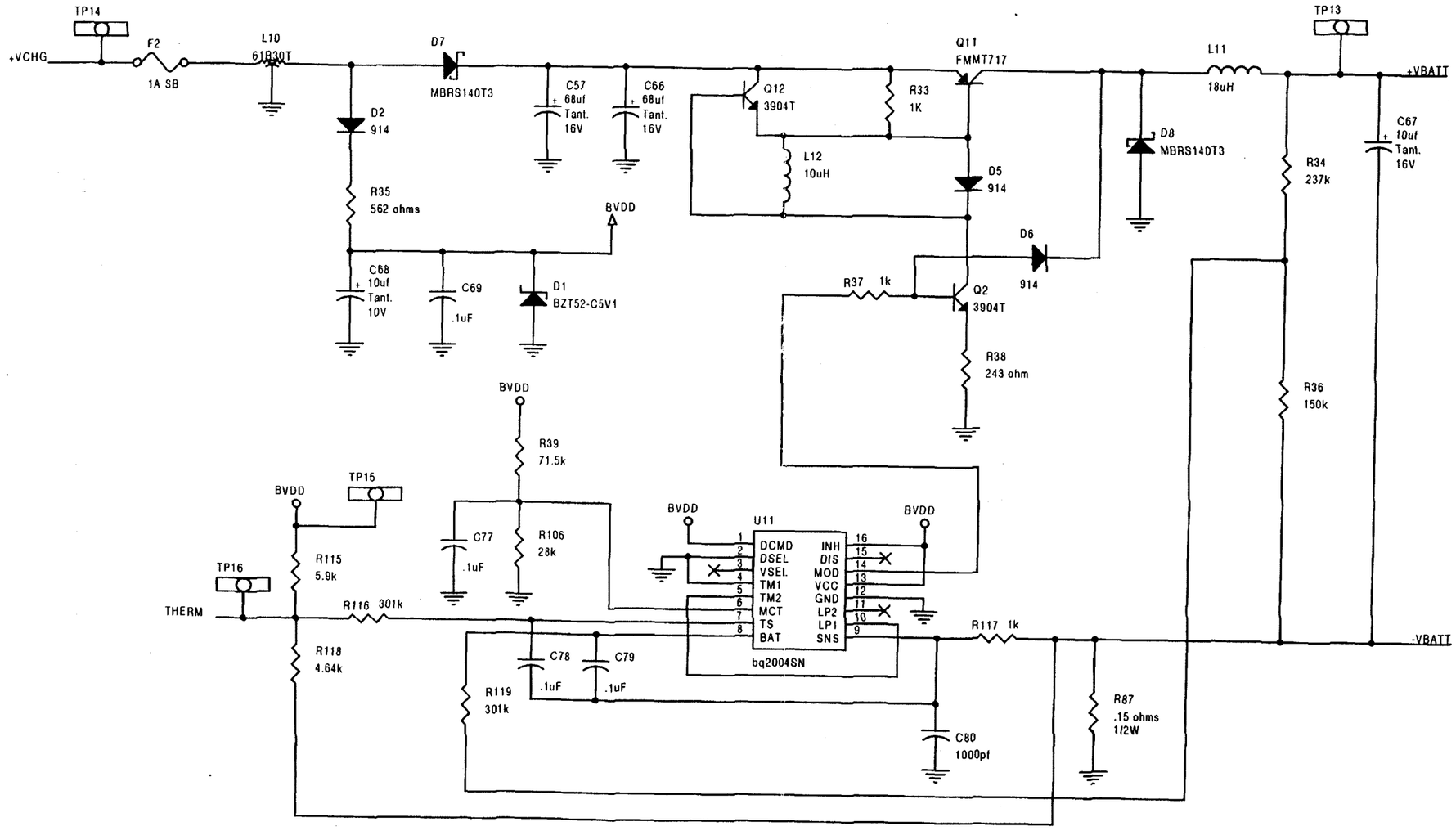
Sheet 6 of 9



			MODEL 101 MAIN BOARD	Novametrix	
			Drawn: A. Esposito Jan 8, 1997	Checked: MRL	Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492
			Mfg Eng:	Approved: AJE	Size B / Document Number 2740 / Code 03 / Rev 01
01	N529	12/24/97	File: 2740-03-00		Sheet 7 of 9
Rev.	"R" No.	By Date	Date: Monday, July 14, 1997		



			MODEL 101 MAIN BOARD	Novametrix	
			Drawn: A. Esposito Jan 8, 1997	Checked: MRL	Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492
			Mfg Eng:	Approved: AJE	Size B / Document Number 2740 / Code 03 / Rev 01
01	N529	12/24/97	File: 2740-03-00		Sheet 8 of 9
Rev.	"R" No.	By Date	Date: Monday, July 14, 1997		



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			Drawn: A. Esposito Jan 8, 1997	Checked: MRL	Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492
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01	N529	12/24/97	File: 2740-03-00		Sheet 9 of 9
Rev.	"R" No.	By Date	Date: Monday, July 14, 1997		

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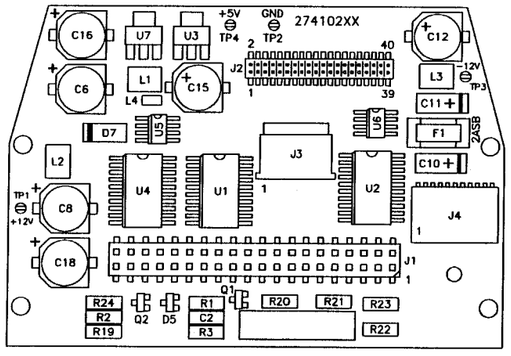
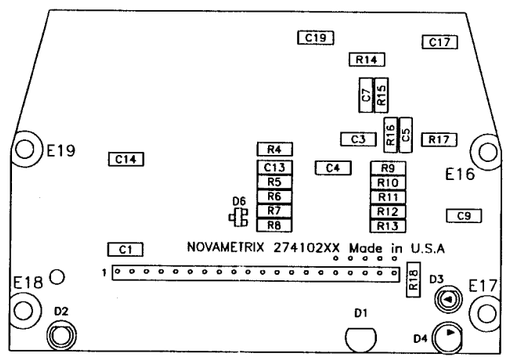




PN	DESCRIPTION	REF DES
2741-02	FAB, INTERFACE BOARD, MODEL 101	~
D2741-03	SCHEMATIC, INTERFACE BOARD, MODEL 101	~
152096	CAPACITOR, 220uF, 35V, 20%, ELECTROLYTIC	C6, C8, C12, C15, C16, C18
154062	CAPACITOR, .01uF, 50V, 10%, X7R	C7, C9, C17, C19
154072	CAPACITOR, .1uF, 50V, 10%, X7R, CERAMIC	C1-C3
154079	CAPACITOR, 10uF, 25V, 10%, TANTALUM	C10, C11
154081	CAPACITOR, 100pF, 100V, 10%, NPO	C5
154114	CAPACITOR, .022uF, 50V, 10%, X7R, 1206 SIZE	C4, C13, C14
180022	INDUCTOR, 10uH, 10%	L1-L3
180043	FERRITE BEAD, 30 OHMS AT 100MHZ, 0603 STYLE	L4
☆ 211514	CONNECTOR, 5 PIN, HEADER, RT ANGLE, .1 SP	J4
☆ 211639	CONNECTOR, 6 PIN, RCPT, RT ANGLE, .05 SP	J3
213411	CONNECTOR, 40 PIN, RCPT, PASS THRU, DIL, STR	J1
213412	CONNECTOR, 40 PIN, HEADER, DIL, STR, .05 SP	J2
☆ 216029	TEST POINT, SPRING LOADED, 475" C MAX	TP1-TP4
280233	SPACER, LED, FOR 2 LEADS, .2 DIA X .1 LONG	(FOR D4)
280234	SPACER, LED, FOR 3 LEADS, .255 DIA X .185 L	(FOR D2)
280235	SPACER, LED, FOR 2 LEADS, .25 DIA X .2 LONG	(FOR D3)
474136	RESISTOR, 1k OHM, 1/8W, 1%	R2, R9-R13
474165	RESISTOR, 10k OHM, 1/8W, 1%	R1, R4-R8, R14
474166	RESISTOR, 100k OHM, 1/8W, 1%	R16
474174	RESISTOR, 332 OHM, 1/8W, 1%	R19, R22-R24
474186	RESISTOR, 15k OHM, 1/8W, 1%	R3
474220	RESISTOR, ZERO OHM, 1/4W, 5%, 1206 STYLE	R18
474274	RESISTOR, 20k OHM, 1/8W, 1%, 1206 STYLE	R15
474276	RESISTOR, 866k OHM, 1/8W, 1%, 1206 STYLE	R17
481546	DIODE, MMBD914L, SWITCHING	D5, D6
481549	DIODE, MBRS140T3, RECTIFIER	D7
☆ 482601	LED, YELLOW, ROUND, .100 SPACING	D3
☆ 482602	LED, GREEN, ROUND, .100 SPACING	D4
☆ 482604	LED, BICOLOR, RED & GREEN, ROUND, 3 LEAD	D2
484558	VOLTAGE REGULATOR, LTC1144CSB, SW CAP	U6
484572	VOLTAGE REGULATOR, LT1129CST-5, 3 PIN	U3, U7
485532	TRANSISTOR, 2N7002T1, N-CHAN ENHAN MODE	Q1, Q2
486314	MC74HC541DW, OCTAL BUFFER/LINE DRVR-RCVR	U4
486323	IC, SN74HC573DW, OCTAL D-TYPE LATCH	U1, U2
487125	IC, LT1302CSB, DC-DC CONVERTER, 8 PIN	U5
515087	FUSE W FUSEHOLDER, 1A, 125V, SLO-BLO	F1

NOTES:
1. D2741-01 SPECIFICATIONS: FOR TEST PROCEDURE SEE A2741-04.
   A. COMPONENTS NOT FITTED: D1, R20, R21
   B. ☆ DENOTES THRU HOLE COMPONENTS.

REV	R NO	DATE

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) (± ~)
FRAC ± ~ (mm) (± ~)
HOLES +.007 -.003 (mm) (± ~)
ANG ± ~
MATERIAL ~
FINISH ~

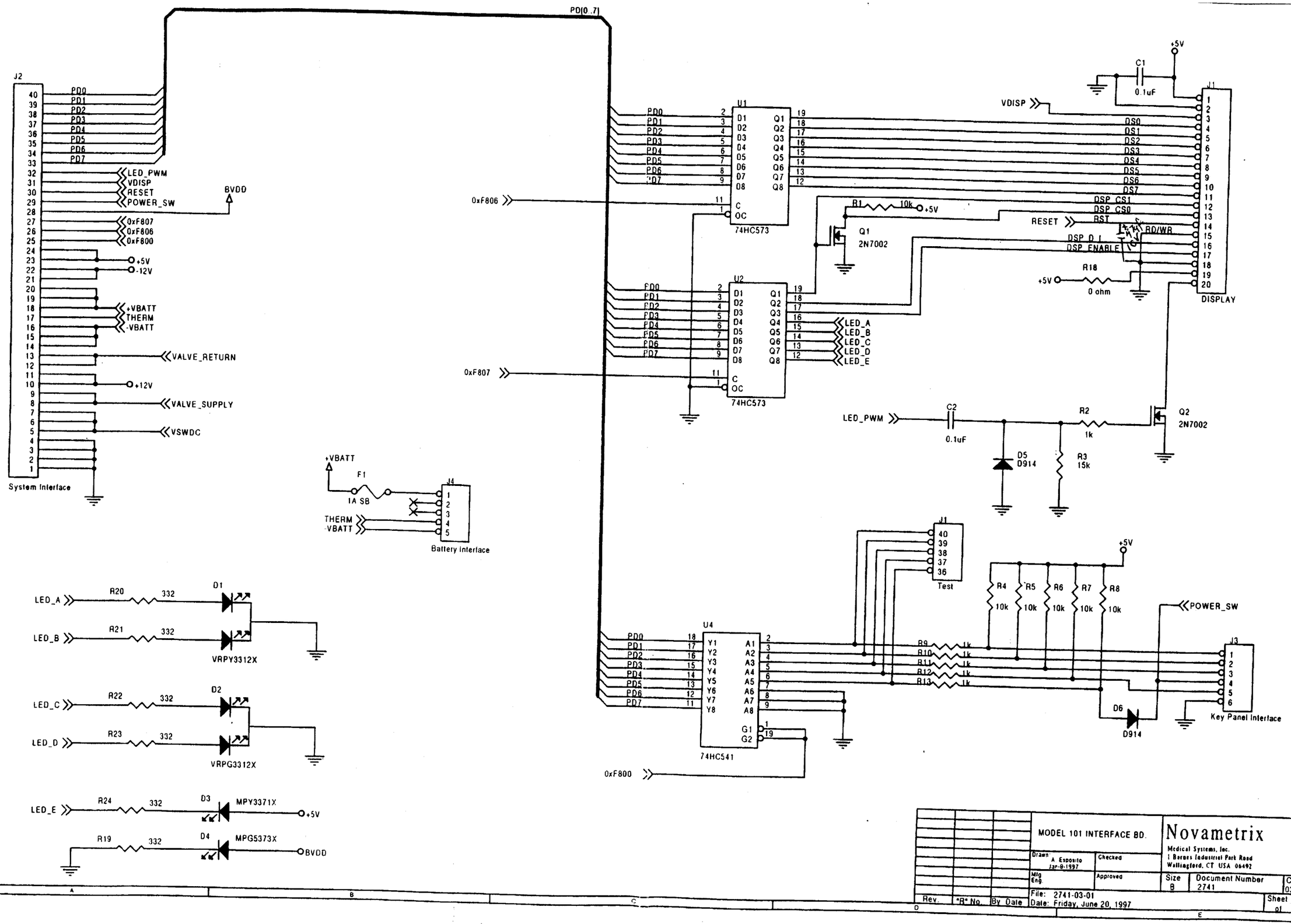
TITLE: INTERFACE BOARD ASSY, MODEL 101 - VENT CHECK

DRAWN BGG 15May97 | CHECKED MRL
MFG ENGR BM | APPROVED AJE 6-24-97
USED ON D8000-01

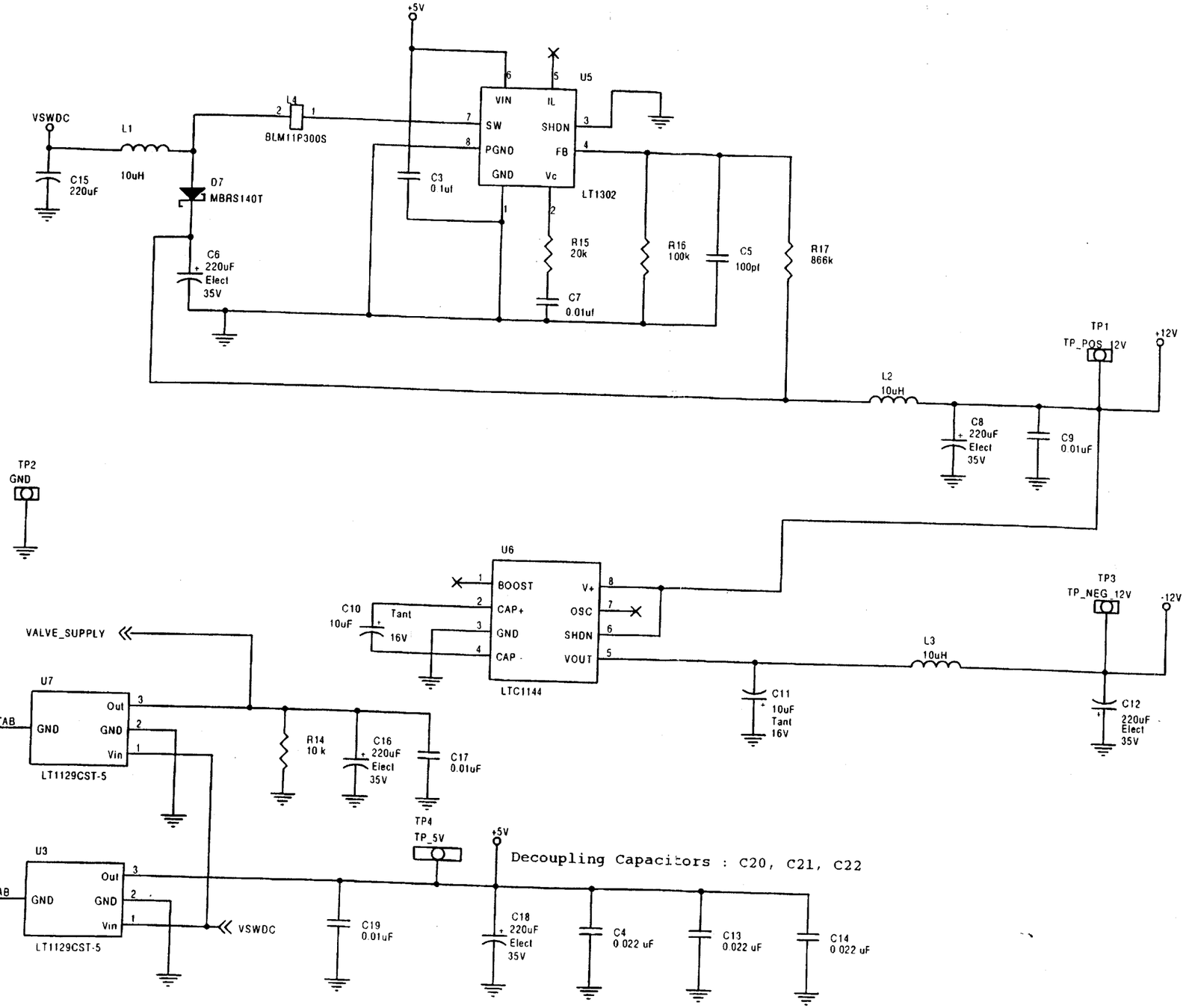
NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO	CODE	REV
D	2741	01	00

SCALE 2/1 | SHEET 1 OF 1



				MODEL 101 INTERFACE BD.	Novametrix		
					Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492		
				Drawn A Esposito Jan-8-1997	Checked	Size B	Document Number 2741	Code 03	Rev 01
				Mfg Eng.	Approved	File: 2741-03-01	Date: Friday, June 20, 1997	Sheet 1 of 2	
Rev.	"R" No.	By	Date						



NOTE:
1.) UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS, 1/8W, 1%
CAPACITANCE VALUES ARE IN FARADS
INDUCTANCE VALUES ARE IN HENRY'S
2.) LAST REF DES USED: C19, D7, F1, J4, L4, Q2, R24, TP4, U7
3.) COMPONENTS NOT USED: D1, R20, R21

Rev	"R" No.	By	Date		

MODEL 101 INTERFACE BD.

Novametrix
Medical Systems, Inc
1 Barnes Industrial Park Road
Wallingford, CT USA 06492

Drawn: A Esposito Jan-8-1997	Checked		
Mfg Eng	Approved		
Size: B	Document Number: 2741	Code: 03	Rev: 01
File: 2741-03-01			
Date: Wednesday, May 28, 1997		Sheet 2 of 2	